THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LIV. No. 1387.] LONDON, DECEMBER 10, 1889. [41ST YEAR. Price 6d.

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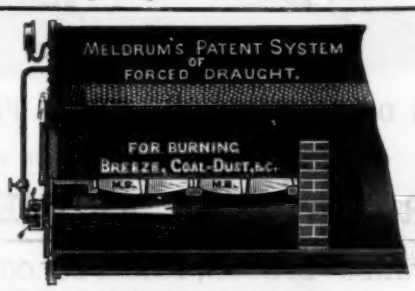

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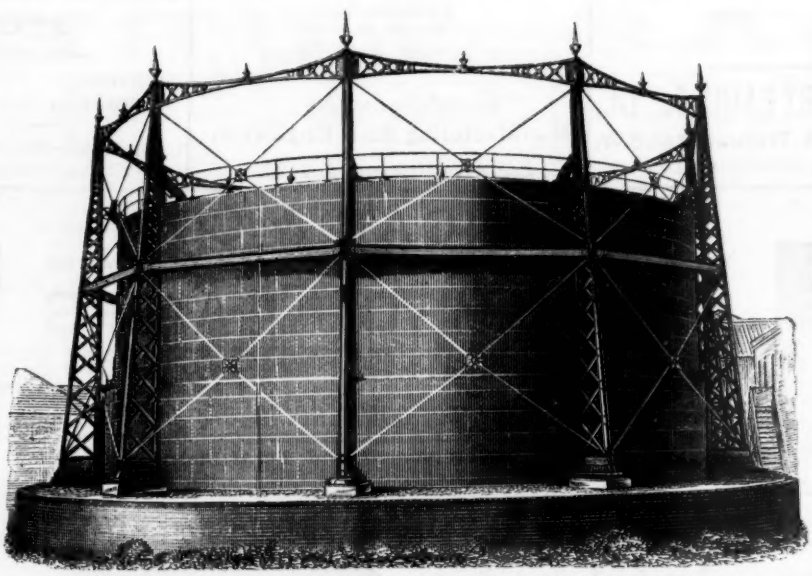

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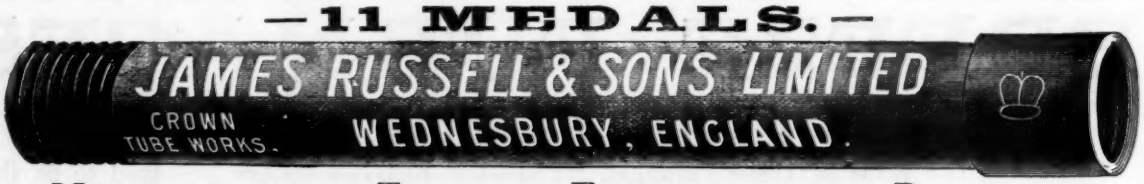

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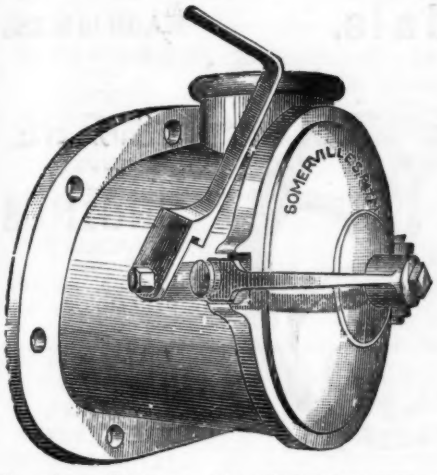

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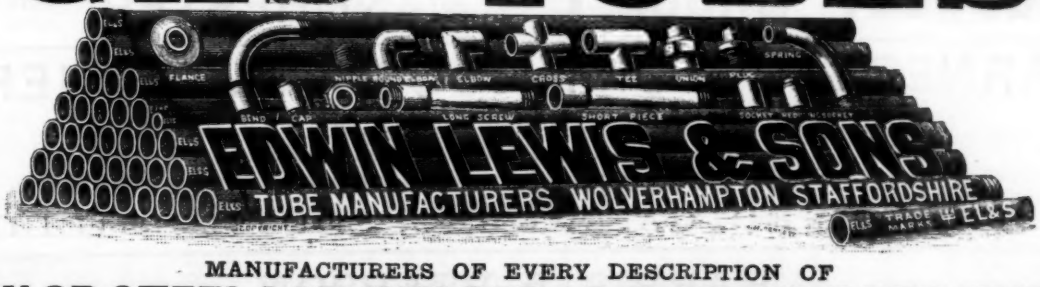

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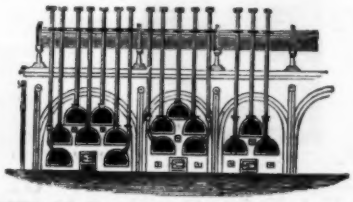

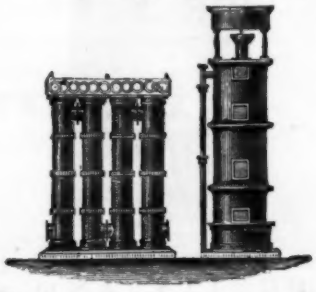

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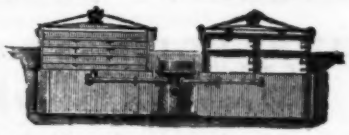

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MADE in SIZES *2-Man to 100-HP.*

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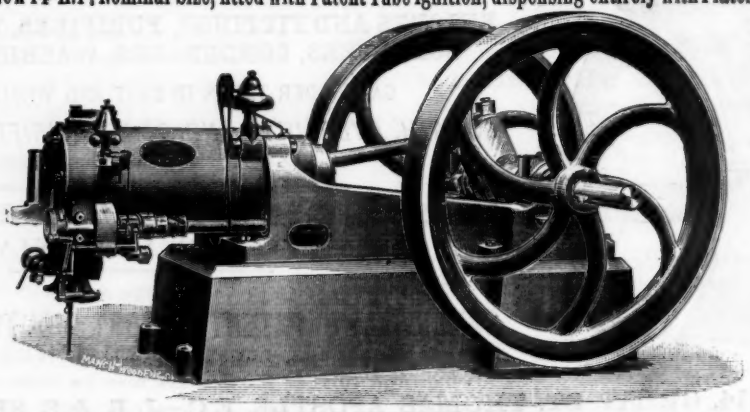

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[*As Illustrated and Described in the* JOURNAL *for May* 4, 1880.]

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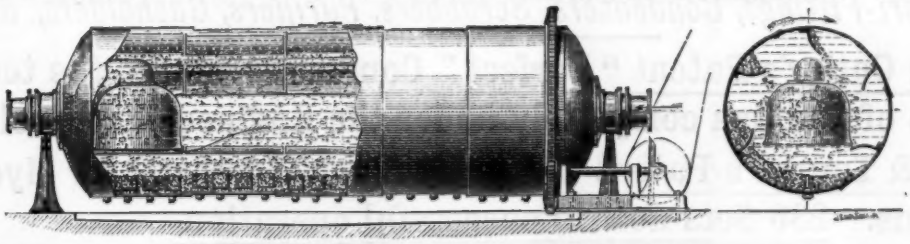

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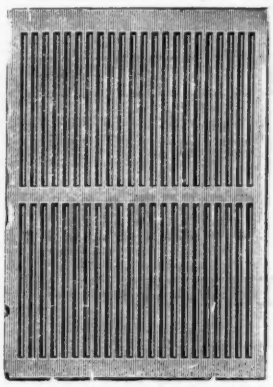

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As supplied to The Gaslight and Coke Company, &c., &c., &c.

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GENTLEMEN,—In reply to your enquiry respecting the result of putting Wooden "Bundles" into some of the Washer-Scrubbers at our Beckton Station, I beg to say that they have answered admirably for the few months they have been in; and I think them a decided success.

I am, yours truly,
(Signed) G. C. TREWBY.

The Improvements comprised in the "New" Patent "Standard" Washer-Scrubber have been applied to the original "Standard" Washer-Scrubbers at Beckton. *(See the above.)*

The Apparatus can be applied to "Standard" Washer-Scrubbers already in use.

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IN ROUND OR SQUARE CASES, ALL SIZES.

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IMPROVED STATION GOVERNORS,
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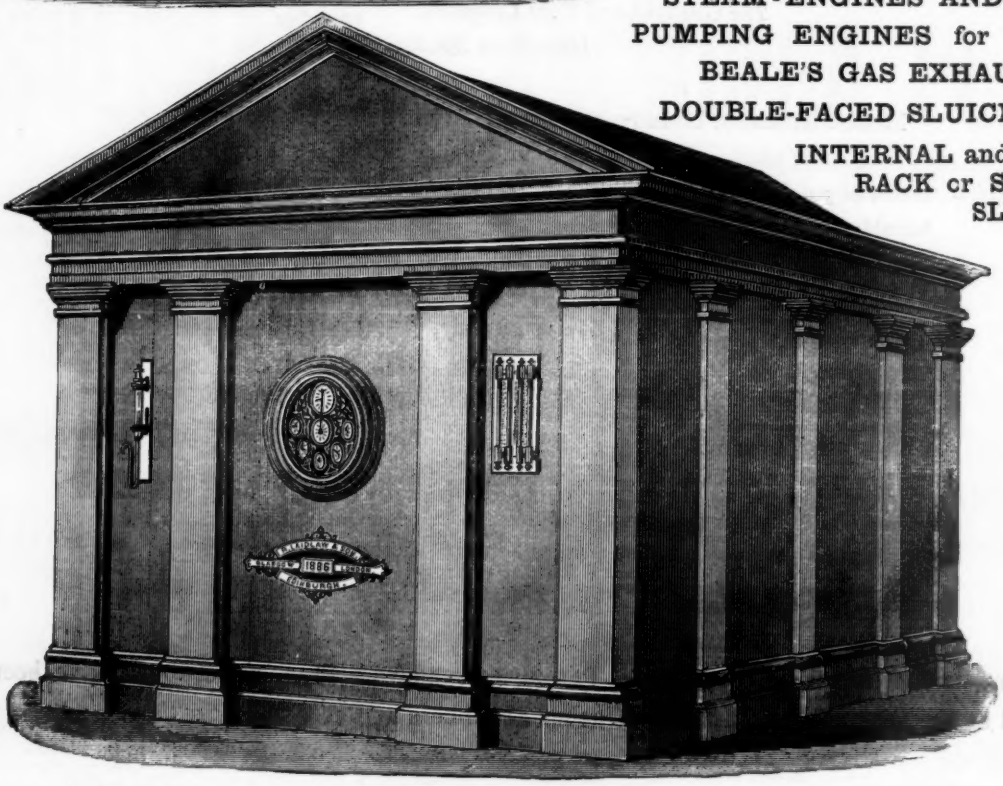

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FOR PUMPING

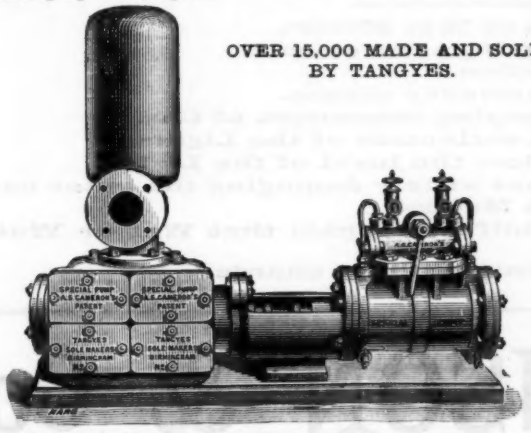
AMMONIACAL LIQUOR, TAR, & WATER IN GAS-WORKS.

Used in the Principal Gas-Works in the United Kingdom.

REDUCED PRICES.

The "Special" Double-Acting Steam-Pump is now made in some 250 sizes, and of many different designs, to suit particular requirements.
In ordering, state the purpose for which the Pump is required, to ensure suitable pump valves being sent.

OVER 15,000 MADE AND SOLD BY TANGYES.



In case of Special Quotations, the following particulars are required:—
Pressure of steam at cylinder.
Number of gallons to be raised in a given time.
The height of lift from level of water to point of delivery.
The nature of the fluid to be pumped.

The "Special" Steam-Pump can be worked by Compressed Air. For pumping Tar or Ammoniacal Liquor, the "Special" Steam-Pump is made with extra long distance piece, for which an additional charge is made.
The quantities of Tar delivered should be taken as about two-thirds those of water given below.

SIZES SUITABLE FOR GAS-WORKS.

Diam. Steam Cyl.	ins.	3	3	4	4	4	5	5	5	5
Diam. Water Cyl.	"	1½	2½	2	3	4	2½	3	4	5
Length Stroke	"	9	9	9	9	9	12	12	12	12
Gals. per hour, approx.		450	1800	800	1800	3200	1250	1800	3200	5000
Diameter Suction and Delivery	ins.	1	2½	1½	2½	2½	2	2½	3	3½
Price	£	9	12	11	13	15	15	16	19	22

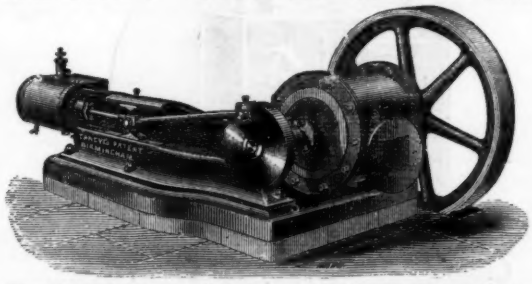
Diam. Steam Cyl.	ins.	6	6	6	6	7	7	7	7	7
Diam. Water Cyl.	"	3	4	5	6	3	4	5	6	7
Length Stroke	"	12	12	12	12	12	12	12	12	12
Gals. per hour, approx.		1800	3200	5000	7200	1800	3200	5000	7200	9800
Diameter Suction and Delivery	ins.	2½	3	3½	4	2½	3	3½	4	5
Price	£	17	20	23	26	19	22	25	28	34

Diam. Steam Cyl.	ins.	8	8	8	8	8	9	9	9	9
Diam. Water Cyl.	"	4	5	6	7	8	5	6	7	8
Length Stroke	"	12	12	12	12	18	12	12	12	18
Gals. per hour, approx.		3200	5000	7200	9800	12800	5000	7200	9800	12800
Diameter Suction and Delivery	ins.	3	3½	4	5	6	3½	4	5	6
Price	£	24	27	31	36	43	29	34	39	46

Diam. Steam Cyl.	ins.	9	10	10	10	0	10	10
Diam. Water Cyl.	"	9	5	6	7	8	9	10
Length Stroke	"	24	12	12	12	18	24	24
Gals. per hour, approx.		16200	5000	7200	9800	12800	16200	20000
Diameter Suction and Delivery	ins.	7	3½	4	5	6	7	8
Price	£	56	32	37	42	50	60	67

TANGYES' IMPROVED

ROTARY GAS-EXHAUSTER.



These Exhausters are supplied with or without Engine. The smaller sizes (Nos. 1 to 6), when supplied with Engine, are mounted on strong cast-iron base plate—as illustrated—which also carries the Engine.

No.	Cubic Feet per Hour.	Inlets and Outlets.	Horse power of Engine.	PRICE.
1	2,000	3 inches.	2	£60
2	3,000	4 "	2	65
3	5,000	5 "	2	75
4	7,500	6 "	2	80
5	10,000	7 "	3	95
6	15,000	8 "	3	115
7	20,000	9 "	4	125
8	30,000	10 "	6	175
9	40,000	12 "	8	210
10	50,000	14 "	10	260

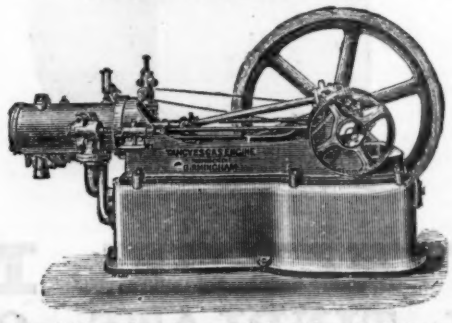
Prices of larger sizes on application.

THE "TANGYE" GAS-ENGINE

(ROBSON'S PATENT)

Royal Cornwall Polytechnic Special Gold Medal, 1882.

(Also for Gas Producer and Feed Pump.)



The ¼, 2½, and 4 horse power sizes are of the type shown in illustration. The 1-horse power size is of the type of the "Tangye" Steam-Engine.

Working size	¼ H.P.	1 H.P.	2½ H.P.	4 H.P.
Test Horse Power	1	1·4	3	6
Revolutions per minute	180	170	170	160
Price, Engine on Base with Tank £	60	82	115	140

Note.—The Test Horse Power in the table above is that given off at the Driving Pulley in actual test with Dynamic Brake at our Works.

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9th—Will last much longer than Wet Meters.
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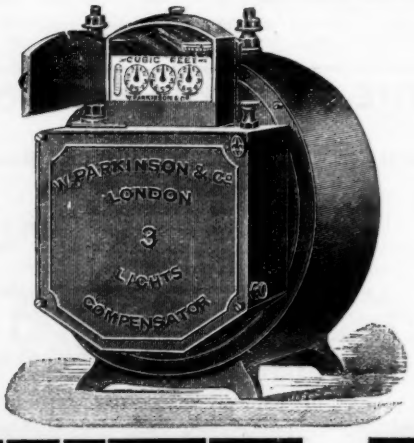

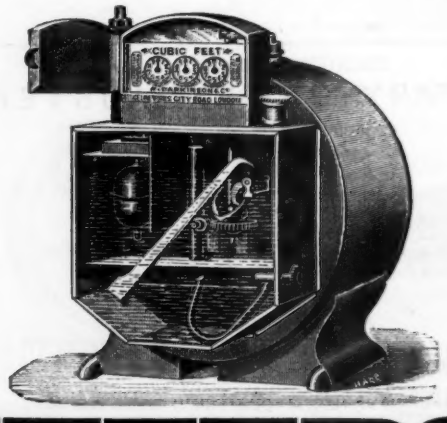

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TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion; but as the Advertisement sheet of the JOURNAL is sent to Press the first thing on Monday Morning, Advertisers will please bear in mind that **Orders for Alterations in or Stoppages of PERMANENT Advertisements should be received Not Later than Two o'clock on SATURDAYS.**

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THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, DECEMBER 10, 1889.

THE STOKERS' STRIKE.

THE crisis in the fortunes of the Gas Workers' Union has come at last; and a very few days will now show whether mob law or just order is to rule the gas-works of the United Kingdom. War is openly declared between the Union on the one side and the employers on the other; and when it is over, one party must be vanquished. There will be no patched-up peace this time; for the employers have learnt during the past few weeks that no reliance whatever is to be placed on agreements with their men in which the Union leaders have a hand. Attempts to treat with the men on equal terms have been made all over the country. In some places settlements so arrived at have held good; but in others—comprising unfortunately the Metropolitan and other leading undertakings—the agreements have been broken by the men as soon as made. A so-called settlement has for them only formed a stage towards further demands; and the spirit that has inspired the counsels of the Union Executive has been such as to render the breaking out of hostilities merely a question of time and opportunity. As a trial of strength between the two parties was inevitable, there is a certain satisfaction in the thought that it has come, and that the worst has therefore to be faced once and for all. Better a sharp, short struggle upon a clear issue, than a long bickering which might at any moment develop into a deadlock. This time, moreover, the men have elected to stake their all upon a point with regard to which the employers occupy the strongest possible position. If the employers had been permitted a choice of ground for the great conflict, they could not have done better for themselves than the men have done for them. We have all along entertained the opinion that unless the Union could organize a strike at the beginning of the heavy work of the present winter, their strength and opportunity would be gone. We believed, however, that the struggle would arise over a demand for an advance, probably of 1s. a day, in stokers' wages; and still think that this would have been more popular with the bulk of the men, and certainly more to the advantage of the Union, than the question that has actually precipitated the life-and-death conflict. The event has been otherwise; and the Union has chosen to pit its existence upon the claim to be paramount, and to deny the right of earning a livelihood in the same service to all who do not belong to it. In combating this outrageous tyranny, the employers will have the support of every Englishman whose sense of fair play has not been perverted by faction, or who is not misled by superficial and disingenuous newspaper reports and comments.

The facts of the crisis are soon stated. We noticed last week that the Manchester and Salford Gas Committees would probably stand firm in their determination not to yield to the Union demands for the dismissal of non-Society workmen; and on Thursday the men's time expired, when they were locked out accordingly to the number of 1200. At the very last moment these bold strikers "saw the red light," as they themselves would express it, and asked permission to withdraw their notices. It would have been the height of folly to accede to this request; and so the strikers were told that their places were filled up, and they could only come back individually like other casual recruits. It is creditable to the Committee that they extended this measure of pardon to the men whose wilfulness has caused them so much trouble and expense. There may for a day or two be a deficiency of gas in Manchester and Salford; but there is every reason to believe that the public are thoroughly in sympathy with the Corporations, and will put up with some inconvenience to help forward the struggle against labour tyranny. Meanwhile Union funds will have to support the strikers; and there is little prospect of these being reinforced to any useful extent by outside contributions.

The scene of the drama must now be shifted to London. On Wednesday last the Directors of the South Metropolitan Gas Company received an ultimatum from the "President" and the Executive" of the Gas Workers' Union, demanding the immediate withdrawal of their lately promulgated profit-sharing arrangement, and the dismissal of all men who had adopted it. The terms of this declaration will be found elsewhere, and will be seen to be as arrogant a pretension to supreme power as ever any misguided despot has yet asserted in this world. The Board unhesitatingly rejected the ultimatum, and prepared for consequences by immediately notifying to all the daily papers what was going on. When next day it was known that the men had actually sent in their notices in accordance with the threat of their Union leaders, the matter was immediately treated as of first-class importance by all the newspapers, some of whom, as a matter of course, laid down at once exactly what ought to be done by the Gas Company, whose very name they hardly knew, in the treatment of a quarrel which they scarcely took the trouble to understand. However, it is by this time realized that matters have come to a climax in regard to the gas supply of South London; and it is much to be thankful for that those directors of public opinion who really seem to appreciate the situation are unreservedly on the side of the employers.

Of course, some newspapers favour the men; saying that they are justified in objecting to the profit-sharing scheme

because it is a blow at their Union and removes their right of striking. It is undeniably intended to render the Union superfluous, by conferring a benefit on the men which their own organization could never secure for them; but is not this a fair subject for bargaining with the men? They are not compelled to adopt it. There is no attempt on the part of the Directors, as the *Pall Mall Gazette* puts it, to force the scheme "down the throats of the men by the cruel enginery "of a strike." How utterly perverse is this way of stating the case should scarcely need to be demonstrated; yet it is an idea that seems to be entertained by several newspapers, which argue that if the men do not like the profit-sharing scheme, it is only for the Directors to drop it, and all will be well again. The men have issued an explanation of their position, in which the crude arrogance of the ultimatum to the Directors is replaced by plausible objections against the scheme, and the word "blacklegs" is prudently dropped. Naturally, the newspapers that exploit the "Labour Party"—the *Pall Mall Gazette*, the *Star*, the *Evening News*, and (half-heartedly) the *Daily Chronicle*—jump at this chance of excuse for supporting an act of tyranny; but it will not do to let the point be disguised in this way. The rights of the matter are plainly upheld in several influential journals, and due care is taken to collate the Manchester and Salford affairs with the South Metropolitan trouble. If the profit-sharing scheme is the *fons et origo mali* in South London, what accounts for the Manchester strike? It is one and the same Union that has ordered both; and it is impossible to explain one without the other. Whatever it may please some of the London newspapers to pretend, for the sake of currying favour with the labour party, the strike arises out of the attempt on the part of the Union Executive to take away the livelihood of men who do not think fit to pay them their weekly twopences; and, as was said last week, better that all the gasholders in the land should go empty, than that tyranny such as this should rule rampant. What is more, does any sensible man think that giving in to the Union on this point, at the sacrifice of right and independence, would satisfy the leaders? Not at all; it would be precisely as before. Next week another move, and this time an irresistible one, would be made to carry out the principles of the great Mr. John Burns, who says he never yet met a man worth more than £500 a year, and probably holds that no man is worth less. It is very certain that if a stand is not to be made in defence of right and liberty, it will never succeed if attempted later in defence of a purely selfish interest.

Thus it must be maintained that the objection to the South Metropolitan profit-sharing scheme is only a blind. Nobody wants the stokers to have it. It may be all the "bogus" plan that some of the newspapers describe it to be; but, if so, the stokers would only be justified in leaving it severely alone. That the men know it is not a delusion is shown clearly enough by their communication to the *Daily Telegraph*, to the effect that if it was put in the form of an absolute increase of wages they would take it gladly. No doubt; but that is not the object of the scheme. If they merely persisted in standing outside it, nobody could complain; but what right have they to order the Directors to withdraw it, and to dismiss every man who has taken advantage of it? The latter may be "fools," as the *Star* calls them; but may not a man be a fool in a free country? If not, then our civilization is decidedly a failure.

The fact is that as regards South London the Union officials fear the scheme and want it removed. It is a standing temptation to their constituents, which they feel will in time check the flow of twopences. Thus it was imperative on them to make an effort while the Union is at its maximum strength. We may be sure they did not intend to have the Manchester men out just at this time; hence the desperate effort to get these men taken on again at the last moment. It is naively admitted in the *Star* that the refusal of the Manchester Committee to accept the withdrawal of the notices at the last moment has made the victims "very angry." They will also be sorry before this business is done with, when they find hunger a more objectionable companion even than a non-Society man. If the discomfiture of the leaders of the Union were the only thing to be regarded, one could almost rejoice at the prospect of affairs; but, unfortunately, it is their poor dupes, and the wives and children behind, who will suffer most in this conflict. It cannot be helped; but one cannot avoid sorrowful reflections regarding the mute sufferers in the background who are sacrificed to the ambition of Mark Hutchins and Co., of the Union. As to the prospects of the campaign, these are altogether in favour of the employers. They have a sure position to defend, and plenty of money to do it with. So far as the South Metropolitan Company are concerned, there is the Insurance Fund of upwards of £40,000 to fall back upon; this store being specially applicable in the case of strikes. The Directors are offering their new hands a bonus of £2 for the first week, and £1 for every subsequent week of the strike, in addition to the ordinary wages; besides which the men will if necessary be housed and provisioned in the different works. Arrangements will be made for police protection for the fresh workers, if required; and as there is plenty of coal in store, and ample retort and gasholder capacity, the Directors are confident of victory. The Manchester and Salford Committees say the same. Of course, there will be considerable difficulty in making the raw hands familiar with the work; but two or three can be put on in the place of one, if needful, for the first day or two, when the pinch will be felt. As we have said, the Union leaders were bound to order a forward movement if their organization was to hold together, and in one sense they have chosen a good time for making trouble for their employers. If the time is favourable for the men's chance of victory, however, it will be doubly disastrous for them in the event of defeat; for no more stokers will be required at any gas-works for the rest of the season, and they will have no chance of repairing their blunder. If the employers are ever so lenient and forgiving, a whole year must pass before the majority of the men who go out at the dictation of the Union can be taken on again at the works. It is absurd to think that the Union can maintain them all this time. As already remarked, the Union cannot build upon public assistance, especially at this time, when the balance-sheet of the Dockers' Strike Fund is so seriously exercising the public mind.

The worst result of this affair of the Union will be the check put upon future concessions to workmen. If there is to be all the waste and worry of a strike after so much has been granted, employers will argue that they may as well refuse everything, and get the trouble over first instead of last. If the Gas Companies had resisted the request for eight-hour shifts, they could but have faced a strike, and the Union would not have been so strong as it is now. This is what might be said on the side of the employers; and it is at least as reasonable as much that is now advanced on the part of the men. After this experience, it will be difficult to convince employers that the formation of a Union does not mean a strike as soon as the opportunity offers; and they will feel justified in using every means within their power to crush such a movement in its beginnings. It is a lamentable feature of the present crisis that no Arbitration Board could deal with it. The most successful Arbitrators could only formulate a settlement; and there have been enough of these. What is the good of an agreement, whether arrived at by arbitration or mutual consent, which one side profess in advance their intention of breaking whenever they think they want something further? The time is past for mutual agreements. War is declared, and must be carried out to the bitter end before there can be be any expectation of a settled peace; and may God defend the right!

Inquiry at the head-quarters station of the South Metropolitan Gas Company on Monday at noon, showed the existence of a very strained condition of affairs so far as the retort-house work was concerned. The men were extremely restless—ready to throw down their tools at a moment's notice if provoked by the appearance of a recruit in the yard. It was remarked by all the foremen and on-lookers that "things "were very rough." There were pickets at the gates; but policemen in twos and threes prevented anything like obstruction of the footways or intimidation. Groups of men, and even single hands, had no difficulty in passing in to enrol themselves for service on the tempting terms offered by the Company; and from the numbers of these volunteers, it did not seem likely that there would be any difficulty in manning the works when the Unionists turn out, without resorting to any other unusual expedients. It is quite possible that there may be rough times within and outside the works at the close of the allotted period for the Unionists' departure; but the Engineers are prepared for every eventuality inside, and the police may be depended upon to guard the outside of the works. The men held a mass meeting on Sunday to keep up their courage; but they

could not refrain from showing violence to an unfortunate dissentient, which fact, with the abusive language of the speakers, does not support their assumed confidence in the result.

MR. WATSON SMITH'S PAPER; AND THE DINSMORE PROCESS.

In the absence of a satisfactory organization to which investigators may report the result of inquiries into matters affecting the general industry of gas supply, some important papers have been sent to various branches of the Society of Chemical Industry. This is to be regretted; but it cannot be helped under the circumstances. It is unfortunate not only for the gas industry, but also for readers of papers, who cannot ensure that their immediate audience shall be sympathetic and withal capable, by competent criticism, of advancing the question under examination. The latest example of a good paper that has "gone wrong" in this way is that of Mr. Watson Smith, who on Monday last week read before the London Section of the Society of Chemical Industry an instructive communication on "Variations" in the Products of the Distillation of Gas Coals." There was special reference made in the paper to the mystery of naphthalene production; and, indeed, the whole of Mr. Smith's statement is worth the most attentive perusal by gas engineers. We say "perusal" advisedly, for there was none to discuss it orally at the meeting. From this fact it appears that the Society of Chemical Industry cannot command an audience of gas engineers; and hence that anybody who presents a gas paper to it must be resigned to appealing to his true public at second hand. We shall not discuss Mr. Smith's paper here, except to repeat that his observations on the production and quality of tar, taken in connection with the quality of gas, are highly suggestive. When reading papers of this character, in which the products of coal carbonization are treated so rationally, it becomes more astonishing than ever that such projects as that of the Dinsmore Company (which is dealt with in our "Correspondence" columns by Mr. W. A. Valon) can remain debateable for so long. Surely, it may well be thought, there are practical tar chemists enough to shed light upon a matter of this kind, if they were set about it by anyone sufficiently interested in the result. If a chemist, accustomed to work in tar, and an honest photometrist could not settle the rights of the Dinsmore process in a week, then all we can say is that chemistry has no claims to be regarded as an exact science. We say this on the presumption that searching examination of the process is still required; but this will depend, in the opinion of many independent engineers, on the defence that can be offered to Mr. Valon's damaging arithmetic.

Spontaneous Combustion of Coal.—Last Friday a stack of coal (about 600 tons) at the Maidstone Gas-Works was found to be on fire through spontaneous combustion. Owing to the coal being very much confined, some difficulty was experienced in extinguishing the flames; but this was effectually done with the assistance of the local Fire Brigade. The occurrence was much exaggerated by the newspapers; the fact being that people living in the neighbourhood of the works did not, we believe, know anything about it till they read of it on the following day.

The Fifth Edition of Newbigging's Handbook.—The new edition of "Newbigging's Handbook," which has been expected for some time past, is published to-day. An extended notice of the book, which has come to be regarded as indispensable for all gas engineers, gas-works managers, and others engaged in the practical work of gas making at home and abroad, will appear in due course. Meanwhile it should be understood that the work has been greatly enlarged and written up to date by the author; so that it is really a new book of data for the gas industry, differing in many respects from all previous editions, and occupying a unique place in gas engineering literature.

The Position of the British Water Gas Syndicate.—The Directors of the British Water Gas Syndicate have issued to the shareholders a circular intimating that the call of £1 per share on the 20th prox., of which notice was recently given, is withdrawn, and that the call need not now be paid. They add that, though the Board have not received formal demand to call a meeting of the shareholders, it is their intention, at the earliest possible moment after the action has been tried for specific performance of contract against the Nottingham and Derby Company, to call such meeting, at which they will be anxious to make all explanations as to the position of matters affecting the welfare and prospects of the Company. The North British Company and the Yorkshire Company are, they say, now working in conjunction with the Syndicate in a completely satisfactory manner; and the Board are glad to state that the commercial progress made is of a most encouraging and satisfactory nature.

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1123.)

The past Stock Exchange week was a consistently dull one throughout; and every market was more or less depressed. This arose rather from the calm produced by a general abstention from speculation than from any event occurring to produce active alarm. Not even the easier turn of the Money Market could revive enterprise. As for the Gas Department, there has been but little change in prices, except for South Metropolitans, which have been depressed by the threatened strike. All warfare is costly, both to victor and vanquished, and therefore [unless the coming struggle be averted, which is not impossible at the moment we write] the Company—win or lose—will have to spend some money over it. It will, however, be money well spent, if the fight is forced upon them, and they can afford it. But surely no more ridiculous spectacle could be presented than that of men striking against an increase of wages. They will find it hard work to extract an ounce of sympathy from any section of the many-headed public; and if it be really true, as some allege, that our rulers trim their sails to the popular breath, they will find no difficulty this time in discovering from which quarter the wind blows, and will take better steps to secure law and order than they did in the case of the dockers' strike. In effect, South Metropolitan "A" fell 5; and "B" 4. In Gaslights, the "A" was fairly active and firmer at first; being marked at 247 on Tuesday. But after that it fell away in sympathy with the markets in general, and closed 1½ lower than it opened. A little business was done in the secured issues; but it showed nothing remarkable. Commercials have been quiet, and have not moved. We have heard that this stock is extremely scarce, and that would-be buyers cannot get what they want; and we are inclined to believe this is so. Suburbans and Provincials have scarcely had a transaction in them, and are quite featureless. The Foreign division has been almost equally uneventful; and the only change is a fall of ¼ in European, £5 paid. The Water Companies have been less lethargic, and a fair amount of business was marked at about the old figures. In the result, New River is 1 up, and East London is 1 down.

The daily operations were: Gas opened pretty firm on Monday, and was fairly active, especially Gaslight "A," which was quoted 1 higher. There was nothing to note in Water. On Tuesday, Gaslight "A" was better still, and closed at its best. Other issues were scarcely so good. Among the Water Companies, Chelsea was in some demand. Business was quieter on Wednesday; and the influence of the general apathy that came over all the markets began to be felt. Transactions were mostly in Gaslights, both ordinary and secured, at good medium prices. South Metropolitan "B" was done at 224—the best of the week. Water was hardly touched. On Thursday, Gaslight "A" was done at 246½; but the quotation was put down to 242-246—a fall of 1½. Other dealings showed nothing to remark. Water was a little brisker; and New River rose 1, marking 368. On Friday prices were not very good anywhere. The prospect of a strike put South Metropolitan "A" down 5; and the "B," 2. European, £5 paid, fell ½. In Water, New River maintained its firmness; but East London was scarcely so good. Saturday was rather dull. Gaslight "A" receded 1; and South Metropolitan "B," 2. East London Water also fell 1.

ELECTRIC LIGHTING MEMORANDA.

Fires and Deaths caused by Electric Light Wires — The Brush Company's Contract for Lighting in the City—The Gas-Meter Avenged.

The report given in last week's Journal of the terrible fire in Boston caused by electric light wires, and the death of a shopman from the same cause, is a notable addition to the record of disaster from electric light plant. It has also been stated that a most disturbing casualty has occurred in New York in connection with an underground wire. It is well known that the burying of electric light wires has been advocated as a sure means of escape from the dangers which overhead wires carrying intense currents have been proved capable of creating. As we showed last week, Mr. Edison has never adopted this view, and, in fact, holds that to put a dangerous wire underground is to render it more terrible than ever, on account of the increased risk of contact with conducting substances. Hitherto, Mr. Edison remarks, victims of high power and alternating currents conveyed by overhead wires have mostly been linemen and other servants of the electric light companies, whose business has lain among the wires hanging out of ordinary reach. When these are put underground, there is no saying what the current may not pass into—gas or water services, coal traps, ventilating gratings, anything, in short, which conducts electricity without showing it. Then, he says, when housewives and domestics are killed on touching a water-tap, when postmen drop dead on ringing a bell, and passengers along the street fall senseless as soon as they step on an innocent-looking grating—then there will be an outcry to which the present is nothing; and instead of asking for the wires to be buried, people will demand that it shall no longer be lawful for anybody to distribute, whether overhead or underfoot, electrical currents strong enough to kill when they escape from the conducting wires.

The Commissioners of Sewers have accepted the tender of the Brush Company for the lighting of a section of the City of London in accordance with terms already published, notwithstanding the vigorous protest of a minority of their body. The Company are

before the Board of Trade with an application for statutory powers to supply in the City; and so at length a patiently worked-out job is about to be brought off. The Brush people have long tried to get a contract with the Commissioners of Sewers; but first one obstacle and then another has arisen to prevent the arrangement. Some members of the Commission could not forget that allowing the Brush Company years ago to light a district of their domain very poorly, at a loss to themselves, at "the same price as gas," was a means whereby the Company deluded a great many people into purchasing concessionary rights in their system, which soon turned out worthless. The connection of the Brush Company with the Commission was thus not so satisfactory that it could be renewed without some hesitancy on the part of the more punctilious members of this body. However, the Company have persevered until at length they have obtained another contract. It is a worthy lesson in commercial principles. If one has a light to sell, there is evidently nothing like multiplying its average brilliancy by four. Never mind how often the trick is exposed and denounced. Keep up the pretence, and it will be accepted some day. What a striking proof is this of the conquering power of sheer audacity!

According to reports that have reached us from the United States, where alone the meter system of electric lighting appears to have been adopted on an extensive scale, the long-suffering gas-meter is at last avenged. All complaints about the mendacity of these much-misrepresented instruments are forgotten in face of the superior capacity in the same line of the electrical meter. Science has not stood still all these years since the gas-meter was invented, but has produced something as superior to it in the matter of running up a bill, as a locomotive is to a stage coach in point of velocity. At least, so the complaint goes. Making some allowance for the exuberance of the average Yankee reporter, who can never be trusted to tell a plain tale, it seems proved that in some American towns the electric meter has been perpetrating strange vagaries of late. The consumers are complaining that while the light is decidedly pretty, the lamps being "very bright and light," the bills are distinctly the opposite. That the meters are partly to blame appears likely from the report that the manager of the company most bitterly complained of has expressed his willingness to make terms with the malcontents by charging on an average schedule, irrespective of the indications of the meter. After this rate, the meter seems a very expensive luxury. Unless one can go into Court on the reading of a meter, it is better to do without anything of the kind. The moral of the story is that electricians are discovering that the complaints of consumers against gas companies, out of which they have made such capital on occasion, are not due to any intrinsic inferiority of the light, or to any radical defect of the gas companies' system, but are merely grumblings of those who pay, which the payee must pocket with his more solid recompense.

THE ECONOMICS OF WATER GAS.

As it seems, from communications that have reached us, that our recent articles on water gas, and the correspondence arising therefrom, have struck an answering chord in the thoughts of many of our readers, it will be desirable to continue the discussion for the information of such British gas engineers as may be slow to perceive their own interest in the question. That there are many managers of gas-works in this country who at the present time have very little idea of the real bearings of the latest development of water gas industry, is evident whenever two or three of them are gathered together; as, for example, in a district meeting. There are, of course, some men in charge of gas-works who consistently follow a "know-nothing" policy with regard to what they would probably describe contemptuously as "new-fangled notions." They rather pride themselves on never reading the technical portions of the JOURNAL; and it is almost superfluous to remark that they never write or discuss papers at the professional gatherings which they occasionally patronize. All the movements of the day pass by these gentlemen like whisperings of an idle wind. Whatever may be the subject that interests their more receptive brethren—whether it is generator furnaces, purification methods, carborizing systems, gasholder designs, or what not—it makes no difference to them. From year to year they keep on the even tenor of their way. Sound men of business they often are; and the revolving years generally bring them fatness, as they do to the immovable oyster in his bed. But they are seldom very instructive men to talk to. There is a variety of this species of gas manager which is almost more hopeless—we refer to the men who always seem to know all about the difficulties, drawbacks, and objections to every new suggestion, but never admit the existence of any good side to it. They constitute the direct opposite party to that which is always running after novelties; of which latter, however, there are not many representatives to be found among British gas managers. One extreme is as bad as the other, and true progress is generally made by those who are neither slaves to routine and precedent nor feather-headed followers of the latest fashion. There is in all men regularly trained in an established industry a disposition to respect all processes, appliances, and systems that have stood the test of time. It is men half-trained, or wholly untrained in a particular industry who are most generally to be found attempting to revolutionize it. Sometimes, of course, the stranger whose perceptions are not bent, by early training and the force of habit, in a particular direction, sees more than the trained and consequently specialized man. This is conspicuously true of the art and industry of iron manufacture, to cite only one illustration. Bessemer, Siemens, and Gilchrist were none of them trained iron makers or founders. If they had been, perhaps their bold innovations might never have been heard of. So, in gas engineering, we have many instances of improvements in matters of detail, such as the West and Coze inventions, for which we are indebted to practical gas managers who have experienced a common difficulty, and brought an uncommon share of persevering ingenuity to bear upon its removal. When it is the case of a radical change of methods, on the other hand, the projector is generally found to be an outsider.

This fact is alone an objection in the minds of the mere routineers, who constitute the majority in gas management as in every other calling. Routine is so overpowering in their own eyes, that they are disposed to condemn unhesitatingly anything which lies outside it. They feel, however, that respect for routine is not a sufficient reply to all propositions for change of methods; and they are consequently delighted when anybody else undertakes to demolish a new project by force of argument. Him they quote eagerly when the subject is raised before them, and profess to be satisfied with adverse arguments, when in reality it is bondage to routine that keeps them from looking into the matter for themselves. Take this question of water gas, for example. We have endeavoured to show, by statements put forward for what they are worth on the surface, and by reasoning on them, that the question of water gas has lately made a decided advance, which may possibly bring it within the scope of practical British gas politics. We have never denied or sought to conceal the fact that this attitude is something entirely fresh for us. Until very recently we held the opinion, common to all British gas engineers without exception, that water gas was an exclusively Yankee concern, never likely to be heard of for town supplies outside the native land of the Standard Oil Company. We trust, however, that while we live we may be able to receive instruction; and, in fact, a few interesting conversations which we have had of late with American engineers of credit—not all "process-mongers"—and with English authorities who have studied the subject on the spot, have so far altered our earlier convictions that we have admitted the question to be debateable; always providing that certain fundamental data are proved to be acceptable. That many of our readers are at the present time in the position which we occupied a few months ago, cannot be regarded as either surprising or disappointing. We have told fully and frankly all we know about the latest phase of the matter; but a written statement cannot be credited with the same power of attracting attention, shaking previous notions, and carrying conviction, as the living speech of an acknowledged authority brimful of his subject, and armed at all points with facts, figures, estimates, and other controversial weapons, all of which he is prepared to discharge upon his interlocutor. This has of late been our experience, several times repeated; and we only ask those of our readers who have not had the same advantage to take our second-hand and necessarily weakened statements as honest, unbiassed, disinterested representations of the case for water gas as it has been submitted to us.

We were not solicitous to condemn the whole thing as an impracticable dream, because we knew full well that the objections to the idea, as stated in advance by such advocates of the other side as Mr. J. F. Bell, would be only too willingly accepted as conclusive by the great army of routineers whom it is our constant employment to stir up. If there is on one side a dead mass of contentment with things as they are, and inclination to escape trouble by thinking the worst of any novel suggestion, it would be pardonable for any one desirous of arousing attention to usher in his statement by a little clamour. We have not done so, however, but have strictly kept to the facts and assertions at our command; relying on them for any sensation that their proclamation might create. We are not dissatisfied with the result, up to the present time; but more remains to be done. It is certain that some engineers still think that the water gas question occupies the same relative and absolute position that it has done any time these ten years past, and that when the absurdities of which Mr. Samson Fox has been found guilty have been exposed, there is nothing more in the matter for an English gas manager to trouble himself about. This is something like the impression left by the recent mention of the subject at the meeting of the Manchester District Institution. Of course, as inland towns closely connected with the coal supply are chiefly represented at these meetings, it may be agreed that this particular District Association might fairly expect to be amongst the last to require to take cognizance of the new water gas movement. Even Lancashire gas engineers, however, ought to learn the conditions of the problem, irrespective of whether they are to be the last to face it practically. They may have done this; but, if so, very little evidence of the fact came out at the recent meeting.

It cannot be too often repeated, if the idea is to be driven well home, that the new phase of the illuminating water gas question is based on the possibility of an unlimited supply of cheap fluid hydrocarbon. Water gas uncarburetted, but rendered luminous by the aid of an incandescent burner, whether on the Welsbach pattern or the magnesian comb, is out of the question. Even if it were prudent to distribute such a gas, which it is not, the illumination afforded in this way is of a poor order. It is never adopted in America by anybody who can afford anything better; and would certainly not do here. The only resource, therefore, is to carburet the gas; and this may be done in many ways. It

may be taken for a general truth, however, that water gas would never have extended as it has done in America but for the possibility of using crude petroleum for carburetting. The product of the Lima oil-field is not suitable for refining for burning purposes; and it is accordingly sold all over the Continent, from Toronto to Texas, for use in gas-works. Whether it will ever be shipped to England at prices which would bring it within the reach of British gas managers is, of course, the problem of the day. The answer can be supplied by the Standard Oil Company; and, until the Russian pipe-line is made, by them alone. They own the Lima field, and sell the oil cheap enough in the country. Whether they will ship it at the same rate is another matter. The Standard Oil Company are among the most arbitrary and irresponsible powers on earth. Their business methods are most peculiar, and they are credited with the ambition of constituting themselves the only suppliers of petroleum on the face of the globe, by buying up every field, wherever situate, as it comes into the market. If it pleases these autocrats to do so, they can place Lima crude oil in tanks alongside any river in the United Kingdom for about 1d. a gallon; or if they do not favour the trade, it will be difficult to get at any price. It will be understood that all our recent articles on the subject of the prospects of water gas for English gas-works depend upon this cheap supply of oil, and also, it may be said, upon the prospect of obtaining an independent supply of crude oil or refuse from Russia. If it were a question of depending entirely upon the tender mercies of the Standard Oil Company, we should discountenance the notion at once. It may be remarked that some water gas systems, such as the Van Steenbergh, recently described in the JOURNAL, use naphtha instead of crude oil. This is undoubtedly the case; but, as we stated when noticing this system, the question of their economy remains to be answered. The Van Steenbergh may be as economical an apparatus, for all we know, as any crude oil process; but the fact has to be demonstrated. Meanwhile, we shall continue to assert, on the basis of general Transatlantic experience, that a revolution has been brought about in the water gas industry, as applied to town lighting, by the use of crude oil for carburetting; and that if it ever extends to this country, it will probably be through similar means. The question we should like every gas manager to work out for himself is: What price must I pay for hydrocarbon to enable me to take advantage of water gas as an auxiliary to my ordinary working? To solve this little problem will be a useful exercise for gas managers all over the kingdom.

NORTH WALES GAS MANAGERS' ASSOCIATION.

A MEETING of Gas Engineers and Managers interested in the establishment of an Association for North Wales, to which we made allusion in our last issue, was held at Bangor on Friday—Mr. R. Algeo, C.E., of the Menai Bridge Gas-Works, presided. Upon the motion of Mr. T. T. Marks, C.E., of Llandudno, seconded by Mr. T. B. Farrington, C.E., Borough Surveyor of Conway, it was unanimously agreed that an Association be formed, and that the annual subscription for engineers, managers, and secretaries of gas-works should be 10s., and for foremen, 5s.; membership in all other respects being upon equal terms. The first name proposed for membership was that of Mr. Henry Woodall. Mr. Marks afterwards moved the election, as the first President of the new organization, of Mr. Woodall who, he remarked, was now a resident in North Wales, living at Marle Hall, midway between Llandudno and Conway; and it was well known that he evinced an active interest in the Association which had been successfully launched that day, and was prepared to give the members the advantage of his advice and experience. His appointment, too, would be as greatly beneficial to the Association as it would be appreciated by the members, who anticipated an interesting inaugural address from Mr. Woodall, who would no doubt bear in mind that in North Wales those who were entrusted with the management of gas-works were working very much upon the same lines as those works with which their President had been associated. The motion was agreed to. Mr. Marks was subsequently elected Vice-President; Mr. Algeo, Treasurer; and Mr. J. Smith, of Bangor, Honorary Secretary. It was arranged that the next meeting should be held at Llandudno on a date agreeable to the convenience of Mr. Woodall. Messrs. J. Parsons, of Carnarvon, T. B. Farrington, and Robert Dempster, of Penmaenmawr, were appointed a Committee to act with the other officials. Mr. Farrington, in moving a vote of thanks to Mr Smith (which was seconded by Mr. Hughes, of Llanfairfechan) said that the formation of such an Association had long been mooted in North Wales. Thanks, however, to the energy of Mr. Smith, who had gone to a great deal of trouble, it had at last assumed tangible form. Mr. Smith having acknowledged the compliment, the proceedings terminated.

A CLAIM has lately been advanced by the conductors of an American contemporary, *Progressive Age*, that theirs is "the first and only journal" in the world devoted to the interest of gas supply that is printed by gas-engine power. Although the point is such a very small one that no statement of the fact has ever appeared in these pages, it may be desirable, in the interest of truth, to place it upon record that the JOURNAL has been printed by "Otto" gas-engines since Jan. 1, 1883; so that the right of priority in this matter, such as it is, belongs to England instead of the United States.

Communicated Articles.

THE CHEMISTRY OF ILLUMINATING GAS.

By NORTON H. HUMPHRYS, Assoc. M. Inst. C.E., F.C.S.

XXXIV.

At the meeting of the North British Association of Gas Managers, held in 1870, Mr. D. Scott, of Musselburgh, read a paper on the manufacture of gas from the secondary products in the production of paraffin oils.* These secondary products consist of the hydrocarbon bases present in the crude oils, and are removed by alternate treatment with acids and alkalies in suitable apparatus. They are generally known as acid or alkaline tars. After being well boiled with water, or treated with steam, in order to remove the acid and alkali, the tar is in a fit state for the manufacture of gas. It is of a thick, syrupy consistency; and black, inclining to brown, in colour. If distilled, the result is a heavy green oil, of ·947 sp. gr.; and either the purified tar or the green oil may be used for the manufacture of gas—the gases yielded by their destructive distillation being said to be similar to those obtained from cannel coal. Some experiments with a coal dross that, when distilled by itself yielded 8200 cubic feet of 12-candle gas per ton, were made. A mixture of 3 cwt. of tar with one ton of dross yielded 10,300 feet of 17-candle gas. A mixture of 4 cwt. of tar with one ton of dross, worked at an inferior heat (to avoid stopped ascension-pipes ?), yielded 10,200 cubic feet of 32-candle gas. One ton of Limerigg dross and 4 cwt. of tar gave 11,800 cubic feet of 23-candle gas. The mixture of dross and tar is claimed to furnish a good gas-making material at a cheap rate; and if a dross inclined to cake is used, the residue in the retort is a good furnace fuel. Mr. Cursiter, of Dalkeith, tried some experiments with these materials, using ordinary clay retorts, and supplying the green oil through ¾-inch syphon tubes projecting some distance into the vessels. He obtained 15,900 cubic feet of 38½-candle, or 18,100 cubic feet of 23½-candle, or 28,300 cubic feet of 12-candle gas, per ton of green oil; the absorption by bromine being 19·2, 9, and 3 per cent. According to the experiments by Mr. Scott above mentioned, the oil would be capable of yielding 10,000 cubic feet of very high quality gas, or 14,000 cubic feet of 36·5-candle gas. Mr. Cursiter tried a mixture of one ton of splint coal with 30 gallons (2 cwt. 60 lbs.) of the oil, charged into ordinary clay retorts in quantities of 210 lbs. per charge. The coal by itself was capable of yielding 10,000 cubic feet of 14-candle gas per ton; and the mixture gave 12,500 cubic feet of 25·9-candle gas. In this experiment, the coal was pulverized and mixed with the oil. In a second trial, the coal was charged in the ordinary way, and the oil admitted through syphon pipes into the retort. The result from one ton of coal and 42 gallons (3 cwt. 62 lbs.) of oil was 13,140 cubic feet of 23·6-candle gas. In the first experiment, the oil yielded 19,718 cubic feet; and in the second, 17,690 cubic feet of gas. Mr. Cursiter preferred iron retorts for the oil when used alone, as being less porous and better conductors of heat. With iron retorts and moderate heats, a large yield of high-quality gas could be obtained by supplying the oil in a continuous stream. But with clay retorts, at the usual temperatures, the gas was decomposed with great reduction of illuminating value and a large deposit of carbon. So it was preferable either to mix the coal with the oil, or to run the oil into coal-gas retorts. One trial was made with the purified tar, mixed with pulverized dross in the proportion of one ton of dross to 3 cwt. of tar. The result was 11,500 cubic feet of 25·9 candle-gas.

In the course of the discussion following the paper, Dr. Stevenson Macadam presented a report on similar materials—viz., tar oil and distilled green oil. The former was a black, sluggish liquid of ·968 sp. gr., and the latter a green fluid oil of ·934 sp. gr. A sample of Virtue Well household coal, which yielded 10,940 cubic feet of 18·6-candle gas, and an excellent coke, when carbonized by itself, was broken up and treated with tar in the proportion of 30 gallons per ton. The result was 10,600 cubic feet of 17·6-candle gas. Proceeding in a similar manner with the green oil, 11,013 cubic feet of 20·3-candle gas were obtained. The result was not any apparent benefit as to quantity, but a marked improvement in quality, and a doubt was expressed as to the permanency of the rich gas. By running the oils into a retort containing a charge of coke, he obtained 20,460 cubic feet of 22½-candle gas per ton of green oil; and 20,000 cubic feet of 20·9-candle gas per ton of purified tar. The bromine absorption was 12 per cent. in each case. The experiments with the pure materials agree fairly well with those previously quoted; but there is a marked discrepancy as to the mixtures of coal and oil. It appeared that Dr. Macadam, in his experiments, had purposely adjusted the temperature so as to avoid increase of yield, in order to ascertain the actual effect of the oil in improving the quality of the gas given off.

At the 1872 meeting of the same Association, Dr. Stevenson Macadam gave some account of experiments with paraffin oil as a source of illuminating gas.* He used crude oil supplied by the Uphall Mineral Oil Company, having a specific gravity of ·850. He operated in two ways—either allowing the fluid to trickle into a retort filled with red-hot coke; or else first vapourizing the oil in a separate vessel, and conducting the vapours into the retort. The latter plan did not work well, and was rejected, as there was great difficulty in regulating the proportion of paraffin oil, and occasional

* See JOURNAL, Vol. XIX., p. 689. † *Ibid.*, Vol. XXI., p. 766.

risk of fire and explosion. It was observed that the oil gas was not permanent, as shown by the following table (the gas in this case being produced by the second method) :—

	Quality of the Gas.		
	Fresh.	After 24 hrs.	After 72 hrs.
1. High heat	31·9	28·4	26·2
2. Medium	33·2	27·6	25·9
3. Low	37·5	26·2	24·0
Average . . .	34·2	27·4	25·3

The difference in quality obtained by a "high" as compared with a "low" heat is not great; and it is interesting to notice that the high-heat gas was the best in point of permanency. After standing 72 hours, it had lost 5·7 candles; but the "medium" had lost 7·3, and the "low" 13·5 candles. Indeed, after only 24 hours' storeage it was the best. This loss of illuminating value is explained as being due to the condensation of vapours that passed through the retort unchanged, as shown by the appearance of oil in the holder tank; in which case the results in the above table are explained, and the lesson to be learnt is, that the best results in a practical sense may be expected to follow from the use of what Dr. Macadam calls a "high" heat.

A series of experiments in which the oil was allowed to trickle into the retort gave the following results :—

	Quality of the Gas.		
	Fresh.	After 24 hrs.	After 72 hrs.
4. High heat	29·9	26·2	24·9
5. Medium	34·8	27·3	25·2
6. Low	39·5	28·4	25·6
Average . .	34·7	27·3	25·2

These results are very similar to the previous ones. It was found that the flow of oil could be exactly regulated, and the production of gas was regular and steady; so that the chances of fire or explosion were reduced to a minimum. These trials having determined that a gas of 25-candle power could be readily produced from paraffin oil, attention was next directed to the quantity as well as to the quality of the gas. The oil was allowed to flow very slowly into a retort filled with red-hot coke, and the results of four trials were as follows :—

	C. ft. Gas Per Ton of Oil.	Quality of the Gas.		
		Fresh.	After 24 hrs.	After 72 hrs.
High heat	23,200	34·8	27·7	25·4
Medium	21,100	37·3	29·1	26·3
Low	19,960	40·3	28·9	25·1
Very Low	16,800	44·9	29·8	26·5
Mean . .	20,275	39·3	28·8	25·8

These experiments agree in showing that the apparent increase of quality secured by working at low heats practically disappears after about 24 hours' storeage. According to the table, the photometrical value of the fresh gas in pounds of sperm per ton of oil is about equal in all the experiments. But after 24 hours' storeage there is a marked advantage in this respect in favour of the high heat. The depreciation in value was not accompanied by diminution in volume. Dr. Macadam had also tried some experiments with ordinary shales, and found them capable of yielding from 4000 to 7000 cubic feet of gas, ranging from 20 to 30 candles in quality per ton. But, looking at the large proportion of ash in shale, he thought the best plan was to work the shale for oil to be used in the manufacture of gas. In these experiments the oil was not decarbonated to any extent. The coke taken out of the retort after a month's trials was not coated with finely-divided carbon or sooty particles. The condensed liquids, which were equal in bulk to more than half of the oil used, consisted chiefly of undecomposed oil, with a little tar, and could be used over and over again till they were converted into gas. Proceeding in this manner, Dr. Macadam estimated that it would be quite practicable to get double the yield above named, or 46,000 cubic feet of gas, per ton of oil; and he showed that, on theoretical considerations, the oil might be expected to yield 63,000 feet of 25-candle gas per ton.

Mr. John Somerville, writing from Dublin,* questioned the practical applicability of the above results. He had used the M'Kenzie process, in which the oil is mixed with coal; and had also tried the oil separately. He had arrived at results somewhat similar to those quoted by Dr. Macadam, but had proceeded farther with the tests on condensation and loss of quality; and he found that gas made from a similar kind of oil—crude paraffin oil of ·850 sp. gr.—stored under pressure in the usual way, was reduced in quality from 42 to 24 candles in four days. This depreciation was found to be still going on, on the twelfth day, by which time the gas was of only 18-candle power. At the same time, there was a loss of volume of no less than 30 per cent. Mr. Somerville also objected to the assumption that the condensed liquids, if returned to the retort and again distilled at a similar temperature, would yield gas; asserting that they would again be deposited as liquids in the condenser, and that the only way to convert and maintain them in the gaseous form would be to expose them to a very much higher heat, and to raise the temperature of the condensers. Even if this was practicable, gas so prepared would condense in the mains; and therefore not more than two-fifths of the oil could be converted into gas. He had found that oil gas suffered deterioration in the course of distribution, especially with a temperature below 60° Fahr.; and recommended that oil for gas-making purposes should have a setting point of 65°, a specific gravity of ·930, and an explosive or igniting point not under 120°. The impurities should not exceed 20 per cent. when treated with 2½ per cent. of pure sulphuric acid and 3 per cent. of caustic soda. The distillate at 212° should not exceed 5, and that at 248° 7½ per cent., and the boiling point should not exceed 400° Fahr. It should be neutral with litmus and turmeric paper, and free from water. He had used for three years such an oil mixed with coal, and believed this plan to be preferable to distilling it separately. When the coal and oil were thoroughly mixed, and both submitted at the same time to the same heat, the rich gases from the oil joined the poor gases from the coal; and the residue from the oil remained with, and improved the quality of the coke.

Besides the utilization of oil by direct distillation, for the production of a high-quality gas, various inventors have directed their attention to the dilution of the oil with water gas or air, so as to produce a larger yield of gas not exceeding the ordinary quality. This subject has already been touched upon in connection with water gas; but the system now about to be noticed, which forms a fair specimen of a large number, is based upon the admixture of steam, air, or both, with vapour of crude petroleum, and the further subjection of the mixture to the action of heat. The result is that if air is present, the oxygen combines with a portion of the carbon from the petroleum; or if steam is used, it is converted into hydrogen and carbonic oxide, and we have a gas similar in composition to that which would be furnished by the admission of the steam or air, as the case may be, to the ordinary cupola apparatus. A cutting from an American paper * gives an account of the Gearing system, which is said to be capable of affording about 200 cubic feet of good gas per gallon of oil. In the simpler form of the apparatus, a group of seven retorts set in one oven is used, connected one to another in series. Each retort consists of a double cylinder, and the inner cylinder is packed with pebbles. A jet of steam and air is introduced into the first of the series by a suitable injector. It passes through the pebbles in the inner chamber, escapes at the back, returns forward to the front, and then to the next retort. After being thoroughly heated by passing through three of the retorts in succession, it meets with the proper proportion of oil vapour in the fourth, and the mixture passes on through the remaining three. This arrangement of apparatus is said to entirely obviate the deposition of carbon; and the process can be conducted as a continuous operation. No doubt a gas of fair illuminating power could be manufactured by this means; but the specific gravity would be high, and the gas would be very poisonous in character by reason of the presence of a large proportion of carbonic oxide. These two points would constitute grave practical objections with English gas consumers.

* See Journal, Vol. XXV., p. 801.

THE LATE MR. REID'S WATER-METER.

By D. Bruce Peebles, of Edinburgh.

In the notice of the late Mr. John Reid which appeared on the 5th ult. (*ante*, p. 873), reference was made to a water-meter of his invention, which he patented. As many readers of the Journal may not be acquainted with it, and would be pleased to understand its peculiar mechanism, I have much pleasure in forwarding an illustration and description of the meter in Mr. Reid's words, which will make clear the novel and peculiar action of the piston.

Figs. 1 and 2 (p. 1105) are vertical sections at right angles of the instrument; fig. 3 is a modification. The measuring chamber 1, 2 is a cylindrical segment, rather larger than a half circle. The counter-wheels or index are within a glass-fronted box 3, and are acted on by the revolving spindle 4. The piston 5 is rectangular, and is connected to the spindle passing through a slot in the piston; or the piston may itself pass through a slot in the spindle, as in fig. 3. One edge of the piston works in contact with the inner surface of the cylinder, whilst the opposite edge works into a concentric cylindrical cavity of smaller radius, formed in the chord side of the chamber. The chord side is vertical or inclined. The inlet for the liquid is below the central cavity; and the outlet is above it. When the piston is in the position shown, the liquid entering below lifts it upwards and round the course, till nearly parallel with the chord, at which time the lower edge of the piston escapes from the central cavity, and slides down by gravitation over or through the spindle; thus translating the axis of revolution from one end of the piston to the other, when it again ascends by the pressure of the inlet from below, while the liquid above is forced outwards by the ascending piston through the outlet port above. The opposite sides of the piston at the ends are slightly bevelled off, to ensure the piston sliding down just before it comes in contact with the chord surface. A small cavity below is for collecting sediment, which is let off by a screw-plug.

The Committee appointed by the Royal Scottish Society of Arts to report on the merits of the invention, gave great credit to the inventor; but they pointed out what they considered would be likely to interfere with the action of the meter. The only two objections raised were: "First, under that of unequal wearing of the parts, which is an inherent defect in all meters having a rotary movement. But in this meter, the peculiar action of the piston (by which its ends alternately take the periphery and centre of the circle) will ensure as nearly as may be an equal wearing of the sides of the piston. It is therefore not thought that this wearing action will be rapid; and a new piston could be put in so easily and cheaply, that the meter might be kept in repair for a long time at a very trifling expense." "The second objection is what may be termed the dead-point of the piston, where the pressure of the water ceases to act, and gravitation comes into play. . . . Grit, sand, small

* See Journal, Vol. XXII., p. 1009.

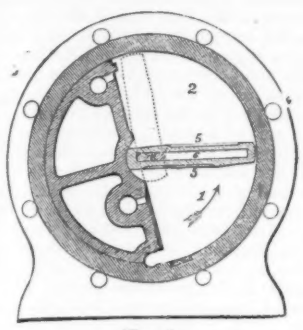


FIG. 1.

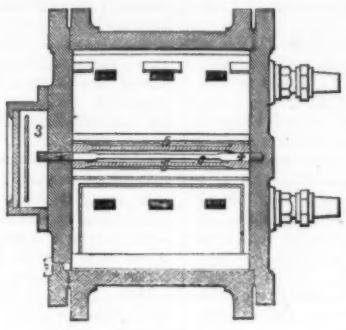


FIG. 2.

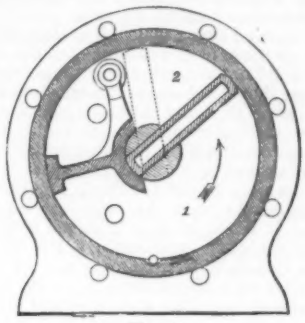


FIG. 3.

either stop the action or allow unregistered water to pass; but pieces of straw, or twigs, might prevent the falling of the piston, and this could only happen in meters of a small size, and may be nearly, if not entirely prevented by a dirt-trap."

The second objection seems to have been justified; for, when the meter was put into actual use, it was found that the piston could not be relied upon to act as promptly as was necessary; so that this most beautiful and novel machine had a short life, and did not come into general use, but, as it were, died soon after its birth. Strange it is, however, that a case of resurrection took place in a city named Tombstone in Arizona (U.S.A.). A copy of the Transactions of the Royal Scottish Society of Arts, or the Patent Office Blue-Book, must have found its way to the hands of a Mr. Frank Walker, a citizen of Tombstone, under whose fostering care the invention sprang into life again, as he, by the addition of a most ingenious valvular arrangement, removed the objection to the action of the piston being dependent on gravitation. It would have been graceful on Mr. Walker's part if, when he patented his improvement, he had acknowledged his obligations to the original inventor, for it is the action of the piston which is still the most distinctly novel and valuable part of the apparatus.

THE VALUATION OF THE METROPOLIS.—The valuation of the Metropolis for the present year is stated to be £38,462,498 gross, £31,592,387 rateable; as compared with £38,028,506 gross, and £31,244,495 rateable in the past year. The figures in 1879 were: gross, £29,682,269; rateable, £24,447,444.

WATER SUPPLY IN SPAIN.—The Madrid Correspondent of *Industries* says that all the Spanish towns of any importance are slowly endeavouring to establish water-works. Lately the town of La Carolina—a place near the district of Linares—has inaugurated works; and before the end of the year works will be opened in Logrono, the capital of the province of that name.

CIVIL AND MECHANICAL ENGINEERS' SOCIETY.—The first meeting of this Society for the current session was held at the Westminster Palace Hotel, last Wednesday evening, when Mr. H. Adams, M. Inst. C.E., Professor of Engineering at the City of London College, delivered the opening address. He reviewed the work of the Society during the past year; indicating the chief points of merit in the papers which had been read, and using each as the text for some practical remarks. The work of the Council of the Society was alluded to, and attention was called to a recent alteration in the rules, by which engineering pupils are admitted without entrance fee. The position of the Society financially was stated to be sound; and a hope was expressed that the roll of members would be largely increased during the current year.

EARTHWORK AND MASONRY DAMS.—At the meeting of the Liverpool Engineering Society on the 27th ult., a discussion took place on the paper read at the previous meeting by Mr. G. Farren, Assoc. M. Inst. C.E., on the "Stability of Earthwork and Masonry Dams" (see *ante*, p. 1005). Mr. Farren first gave a brief *résumé* of his paper, and the Chairman, Mr. F. Hudleston, then opened the discussion, which was continued by a large number of the members present, the majority of whom dwelt upon the advantages of gravity over circular dams. The whole of the speakers concurred with Mr. Farren in his opinion as to the great stability of the Vyrnwy dam. Upon the termination of the discussion, Mr. Farren replied to the various points raised therein; and a vote of thanks was unanimously accorded him for his paper.

INSTITUTION OF CIVIL ENGINEERS.—At the first ballot of the present session, the large number of 10 members, 109 associate members, and 1 associate were elected; 18 associate members were transferred to the class of members; and 53 candidates admitted as students. The names of several well-known gas and water engineers were included in the lists. In the first place, Mr. Joseph Hepworth, of Carlisle, was transferred by the Council to the position of member. The following gentlemen were among the 109 balloted for and elected associate members:—

Robert Bruce Anderson	Westminster
S. G. Thornton Andrews	Swansea
Thomas Bower	West Hartlepool
Arthur W. Brightmore	Vyrnwy Water-Works
Robert A. Browning	Neath
James W. Helps	Croydon
Thomas M'Making	Ceara Gas Company
Joseph Timmins	Wigan

Technical Record.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS

THE DINSMORE PROCESS.

In the JOURNAL last week, we published the paper on the Dinsmore process, read by Mr. ISAAC CARR, of Widnes, at the meeting, on the previous Saturday, of the Manchester District Institution of Gas Engineers, and to-day we give a report of the discussion which took place thereon.

The PRESIDENT (Mr. T. Banbury Ball, of Rochdale) said they had all listened with much pleasure to the description which Mr. Carr had given of the process that he had adopted at Widnes, and had applied to part of the plant. Mr. Carr no doubt would be glad to listen to any criticism or to answer any question with regard to it. Professor Foster he believed would also give them the benefit of his experience with regard to the chemical composition of the gas which had been submitted to him. One point he did not himself understand was the increased percentage of heavy hydrocarbons in the gas after purification as distinguished from it before purification. There was 5·30 per cent. of heavy hydrocarbons in the one case, and 6·76 per cent. in the other.*

Professor FOSTER (London) explained that the table related to three samples of gas manufactured on different days; and the heading of the first column of the diagram placed upon the wall was somewhat imperfect. The first column of the table referred to crude Dinsmore gas; and it contained 2·75 volumes of impurities—carbonic acid gas and sulphuretted hydrogen. After the removal of these, 100 volumes of the gas gave the figures in the table. The same gas, taken from Mr. Carr's experimental holder, was passed through lime in his experimental purifier. The precise character of the gas after purification in the purifier he did not know; but its illuminating power was given in the table as 21·8-candles, and the specific gravity as ·424. Then the next sample of Dinsmore gas (col. 2) treated with lime in the experimental purifier had a specific gravity of ·428. There was even then 0·23 volume of carbonic acid. The illuminating power was given as 22·3 candles, tested with a "G" Argand burner. Then they had in the third column of the table town gas, which had not been in contact with lime, but was simply passed through oxide of iron. The Widnes Corporation did not use lime in the purification of their gas; and in this sample there was 2·09 volumes of carbonic acid gas. The specific gravity of that particular sample was ·420, and the illuminating power was 18·66 candles tested with a "G" Argand burner. The standard Argand was not suitable for testing all kinds of gas; but he had since learned that the Argand which he used, and which was described as having 30 holes, had really 33 holes.

The PRESIDENT asked if he understood that the Dinsmore gas, when the observations for illuminating power were taken, had been purified through lime, and that the town gas had only been purified through oxide?

Professor FOSTER said that was so. He might point out that of the three samples, the illuminating power was 21·8, 22·3, and 18·66 candles. The crude Dinsmore gas, the subject of his experiment, occupied an intermediate position between the purified Dinsmore gas and the town gas, one-third of which was Dinsmore gas. If the latter were perfectly freed of its CO_2, its density theoretically worked out to ·382; so that there was no very great mystery as to whence Mr. Carr obtained the extra 1000 cubic feet of gas which he claimed. It could be explained by the consideration of the specific gravity.

The PRESIDENT observed it was misleading when they put it as it stood.

Professor FOSTER remarked that it only showed how necessary it was to be careful in dealing with imperfect data. It was like a political speech, with the other party absent. The specific gravity, however, made all the difference in the world.

Mr. N. MEIKLEJOHN (Longwood) asked if he understood that the difference in the presence of carbonic acid gas made the difference in the density.

Professor FOSTER said the addition of carbonic acid gas would increase the density.

* The table here referred to is that given in the second column of p. 1063 of last week's JOURNAL.

Mr. MEIKLEJOHN wished to know whether that accounted for the difference between the two.

Professor FOSTER replied that theoretically, if the different gases were all made from the same coal, the density would be the same; but he did not know that they could say how many candles power the gas should be because it totalled up to so many units—coal gas containing so many different compounds, which varied according to the nature of the coal used. Some people imagined that a machine would be invented which would automatically show the illuminating power of gas, apart from the photometer. For his own part, he did not think a machine would ever be obtained which would show that with gas made from different sorts of coal. It might be done with gas made from the same coal, and under the same conditions; but if the coal or the temperature were varied, different products were the result. If they took the carbonic acid gas away from the town gas, the density of the remainder would be, as he had said, ·382. Therefore the anomalous position of the town gas, with a high specific gravity, and a low illuminating power, was at once explained. The purified Dinsmore gas was not absolutely free from carbonic acid. There was 0·23 of a volume in it; and the existence of that quantity explained the difference between the two samples. It was rather surprising when they came to take it away what a difference the carbonic acid gas made. The weight of 1000 cubic feet of this gas, of a specific gravity of ·420, was about 33 lbs.; and this would be the weight of not more than about 3 gallons of tar, so that its source was all explained.

Mr. W. W. HUTCHINSON (Barnsley) said he should like to ask for further information with regard to the difference in the quality of the tar. Mr. Carr had given them the value of his tar, as recently proved by advertising for tenders, as 19s. 8d. He should, however, like to go further and ascertain what was the particular difference in the tar. As far as he could judge, it seemed to him that the process extracted the light oils or the carbonaceous matter in the tar rather than caused any particular rudimentary change. He should like his opinion on this point confirmed or controverted, and to get as full information as possible as to the value of the tar from the distiller's point of view. As to any further remarks he should prefer to leave them until the next meeting; so that they might have time for reflection and consideration. The paper was very valuable and exhaustive; and he felt much indebted to Mr. Carr for producing it.

The PRESIDENT said they would never have a better opportunity of discussing the matter than they had at the meeting. They had the authority for the statements in the paper present; and the explanations would be much better and fuller than they could be on any future occasion. The point as to the value of the tar was a very important one; and it would become of more importance as the price of tar increased. One difference in the quality of the tar would arise from the fact that there was three times the quantity of water. In one sample referred to in the paper (tar containing one-third of the product of the Dinsmore process), there was 4·1 per cent. of water; and in the other (from the Dinsmore process alone), there was 10·3 per cent. of water. Of light oils there was only 3·6 per cent. in the Dinsmore tar, against 6·2 per cent. in what was described as "ordinary tar," though it was partly Dinsmore. This perhaps proved very little. What they wanted to know was at what temperature these light oils were given off, because there were light oils *and* light oils; and some were more volatile than others. He confessed that he did not quite follow Mr. Carr in his statements as to the value of the system. In the first place, he said that the value of the system to them, favourably situated as they were at Widnes for the manufacture and disposal of residual products, was to be found in its light-giving powers. Then he went on to say that his residuals were just as valuable as the gas. This seemed paradoxical, and how Mr. Carr made the income from the residuals to be equal in value to the gas, he (the President) failed to see. His own impression was that the revenue from the residuals would be about 8s. and from the gas £1.

Mr. J. BRADDOCK (Radcliffe) pointed out that in the drawings the system was shown as applied to single settings of retorts; and he asked if it was also applicable to through retorts or back-to-back settings. If it were limited to single settings, and only applicable to them, this fact would very materially check its progress in other respects. Besides asking this question, he wished to express an opinion. Within the last few days, he had paid a visit to Widnes, to see for himself what the system was like; and he came away with the conviction that it was worth inquiring into. He was satisfied that it was no ordinary thing—that it was no myth, here to-day and gone to-morrow. Mr. Carr had presented a paper which carried on the face of it something to convince them that the process was worthy of further consideration.

Mr. F. PRITCHARD (Huyton) said he had had some experience of the Dinsmore process. In the first instance, he commenced operations under similar conditions to those described by Mr. Carr; but, unfortunately, he was in the position already alluded to by Mr. Braddock, of having single settings back to back. In constructing the duct, he accordingly arranged that the gas should enter from the back, come out at the front, and so up the ascension-pipe. But in consequence of the short distance which the gas had to travel through the duct, and the difficulty of regulating the heats so that the gas might be somewhat cooled before entering the water jacket, he found that he was troubled with constant stoppages in the water jacket and other places. He also found that the heat was too high; and that, as the result, a considerable amount of the light was destroyed. After this, he endeavoured to reduce the heat by blocking up the back end, as Mr. Carr had done; but the distance was so short that he did not get on very well with that. The arrangement gave him some improvement in the illuminating power of the gas; but he did not obtain much increase in the quantity. Within the last week or so he had erected another bed on a different plan. The duct was in the form of a diaphragm retort, made of iron, placed outside the setting and heated by the waste heat from the setting. By this arrangement, he had in his setting of five an extra retort for carbonizing. The waste heat was brought from the front and passed out at the back. The diaphragm caused the gas to travel from the front to the back, and then forward again; giving about twice the distance for it to travel through the duct that there would be in an ordinary single setting. He was able to obtain the bright cherry-red heat to which Mr. Carr referred, except in front, where he was able to moderate it a little. As the bench was one newly started, he could not give definite results as yet; but the illuminating power was considerably improved, and he was saving as near as possible 20 per cent. of cannel, and producing 19 or 20 candle gas. His production during the last week had not been much more than 10,000 cubic feet per ton; but this he attributed to the newness of the setting. By passing the gas through the cast-iron duct, stoppages were almost entirely done away with; and he believed that, with more experience, he should accomplish the same results as Mr. Carr had. His photometer was a Letheby 60-inch open-bar instrument; while Mr. Carr's was an Evans. He believed that with the latter description of photometer, they might rely upon 10 per cent. better results than with the open-bar instrument. He had, however, tested his gas with the "G" Argand flat-flame and "London" standard burners; and the average results were considerably higher than before the adoption of the Dinsmore process. He felt thoroughly satisfied that the figures which Mr. Carr had given were correct.

Mr. MEIKLEJOHN said that like Mr. Pritchard he had had a good deal to do with the Dinsmore system. He was glad to hear Mr. Braddock say that, on visiting Widnes, he came away with the impression that the process was not a myth, but a thing worth looking into. On the faith of Mr. Carr's representations, and knowing that he would not speak without accuracy and authority, he (Mr. Meiklejohn) took up the matter, and persuaded his Company to go in for the process, on the understanding that he should put up the beds within £5 of the cost of erecting them on the old principle. That, he was glad to say, they had been able to accomplish. In about a fortnight, they would be making all their gas on the Dinsmore plan; and perhaps in a few months, he should be able to give the results. He wanted to put up the beds in such a way that, if the Dinsmore process was a failure, he should be able to go on working in the ordinary way. The plan he had adopted was that of having a separate hydraulic main to each bed of retorts; six retorts with one duct, working a setting of seven; the gas going in at the back, and the outlet of the duct at the front, surrounded by a water jacket 7 feet in length. The hydraulic main was fitted with two valves, one for working in the ordinary way, and the other for the Dinsmore process. Each retort was fitted with an ante-dip of his own design; so that the gas could pass directly into the duct without coming in contact with the tar or liquor in the hydraulic main. He had obtained a considerable increase in illuminating power, but the quantity of gas he had not been able to check.

The PRESIDENT: Does the tar pass in in a liquid state?

Mr. MEIKLEJOHN said it had been doing so so far; but he had also passed it through in a gaseous state, and had noticed no difference between the one method and the other. He certainly agreed with Mr. Braddock that, if the system was as good as they hoped it would prove, it would be a great disadvantage if it could only be applied to retorts set in single beds. That would most certainly form a serious deterrent to its use in large works. By the means he had adopted at Longwood, there was no alteration in the appearance or working of the retort-house; and he hoped to get the same results as Mr. Carr, without using the extra valves in front of the retort-bench. By this means the process would be applicable to any existing works, instead of to single beds only. The system had not been working sufficiently long with him to be able to speak definitely of its results; but in the course of three months, the whole of his gas would be made by the process, and he would then be able to give a specific statements of the results he had attained by working on a practical scale. As to Mr. Carr's statement with reference to the value of the gas yielded per ton of coals and the residuals making little or no difference to him, it would certainly not be so in his case, as the value of the Dinsmore process to him depended to a great extent on the extra illuminating power of the gas, and the increased quantity sold per ton of coal. His own design had been made entirely distinct from Mr. Carr's; and one objection he would have to Mr. Carr's method was the heavy dip in the hydraulic main, as if anything went wrong with the Dinsmore duct, and the process had to be worked in the usual way, the heavy dip would be a decided objection; whereas with an ante-dip, either process could be worked as desired. He thought the thanks of the meeting were due to Mr. Carr for the able manner in which he had brought the subject before the meeting.

Mr. T. DUXBURY (Darwen) was sorry that he was not present in time to hear the first part of the paper. He only heard the latter half of it; and in glancing over the first portion, he had noticed several things which he should have liked to hear. He wished in

the first place to express his thanks to Mr. Carr for the manner in which he had brought the subject before them, and for the elaborate character of the paper. He also thought the Dinsmore Company had done well to obtain so high an authority as Professor Foster to place the figures before them. He (Mr. Duxbury) could not pretend to make an analysis of the data off-hand. If they had had some time to consider them, no doubt they would be in a better position to ask Professor Foster many questions with reference to the figures in his tables. He should, however, like to hear an answer to the question put by Mr. Hutchinson, as to the value of the tar; for why Dinsmore tar should contain so much more water than ordinary tar, and so much less light oils, was not explained. If this difference could be put into money value, the question became one of pounds, shillings, and pence. They had decided to give the system a trial at Darwen; but he was proceeding on rather different lines from those just described by Mr. Meiklejohn. They had taken the process as the Dinsmore people had sent it, with the plan of their setting and fixing throughout; but instead of mixing the Dinsmore gas with the rest of the gas, they were constructing an entirely separate gas-works. The bulk of the works would go on as usual; but a small portion would be given up to this particular system. In the manufacture of Dinsmore gas, they would use exactly the same coals as in the other part of the works; but they would have a separate meter, purifier, exhauster, and washer. By this means, they would be able to compare the one with the other very easily day by day, and to run the two systems concurrently. This he thought was about as good a way as could be devised, in order to test the two side by side. He did not know that he could give any further information upon the matter, certainly not from any experience of his own. He had been to Widnes on three different occasions; and from what he saw there, he was convinced there was something in it; but whether it was due to the process, or to the coal, he did not know. Nothing had been said in the paper as to how or why the additional quality and quantity of the gas could be obtained at so small an expense—*i.e.*, taking the weight of the tar used as compared with the increased illuminating power of the increased quantity of gas.

Mr. Carr said Professor Foster had explained it. The weight of the additional gas was 33 lbs., and of the tar 44 lbs.

Mr. Duxbury remarked that he did not understand that.

Mr. Hutchinson said he should like to know whether the tar which Mr. Carr recently sold at 19s. 8d. was one-third Dinsmore tar and two-thirds ordinary tar; and if so, had he formed any opinion as to the price which Dinsmore tar would realize in the open market.

Mr. Newbigging said he quite agreed with the President that it was very desirable they should discuss this paper thoroughly; and he did not think they could discuss it thoroughly that day. They might discuss it partially; but the discussion should be continued at the next meeting, when other gentlemen would be able to give their personal experience as well as Mr. Carr and Mr. Pritchard. He (Mr. Newbigging) had listened with considerable interest to the important paper which Mr. Carr had contributed to their proceedings. Whether or not there was any difference of opinion among them as to the ultimate economic results of the Dinsmore system assuming it to be generally applied, on the question of increased production per ton, and increased illuminating power, and especially the latter, there was scarcely room for doubt, after listening to the experience and testimony of the author of the paper, and the report of Professor Foster. His (Mr. Newbigging's) only surprise was, that, in converting the hydrocarbons existing in the tar, or a considerable proportion of them, into gas, a higher illuminating power was not obtained. Indeed he did not quite understand why this should not be the case. His experience would have led him to expect that much better results as regards illuminating power ought to be obtained than Mr. Carr had realized. He should have thought he would have converted a larger proportion of tar than one-third of the production. During the initiatory stage of the system, the experimental stage, he (Mr. Newbigging) had occasion to investigate its working. At that time, about three or four years ago, the bulk of the tar—all, except the solid residue—was gasified; the result being that with a production of 8500 cubic feet from Arley Mine coal (iron retorts being used) gas of above 30-candle power was produced. Now he was sceptical enough on that occasion to imagine that perhaps some hydrocarbon was being introduced into the fittings on the experimental works; and he had the whole of the fittings taken down from one end to the other, and examined thoroughly; but he found that his suspicions were erroneous, and that everything was clear and above-board. Of course, the earlier trials were on a much more limited scale than at Widnes; but though it was well known that in laboratory experiments it was always possible to get much better results than in practical working, he should have expected to find higher results than had hitherto been obtained in practical working on the larger scale. Certainly the results, as they were, were striking enough, and such as to establish the fact that the process was a valuable one. To obtain 22-candle gas from ordinary small bituminous coal in everyday working was something beyond what was ordinarily achieved; and a fact of that kind could not be summarily dismissed. It was no new thing this attempt to produce permanent gas of high illuminating power from the hydrocarbons contained in the tar; and he was rather surprised that none of the prevous speakers had mentioned this fact. The process under various modifications had been patented at different times—notably by Montauban in 1838, Lowe and Kirkham in 1839, Grafton in 1841, James Murdoch in 1845, Salmon in 1855, Basford in 1857, and lastly by Dr. Eveleigh in 1869. All of these inventions failed on being attempted on a commercial scale. The difficulty of stopped pipes—ascension-pipes, hydraulic main, and foul mains, all blocked—was the bone of failure in all previous attempts. This difficulty had apparently now been overcome, and that by keeping the farther or exit end of the duct comparatively cool, and water jacketing the exit stand-pipe. Here the pitchy substance was arrested and deposited, and dropping down into the duct was easily raked out. With respect to the question of specific gravity as compared with illuminating power, it was clear to him that they had still much to learn, and perhaps to unlearn, in regard to that. It was evident that what held good for one gas, would not apply in every case. Whilst the illuminating power of the Dinsmore gas was high, its specific gravity, as they had heard that day, was comparatively low. Some years ago he took occasion to investigate the subject; and he prepared a table which he thought would be of use. The table was given on page 260 of the "Gas Managers' Handbook" (fourth edition). The results obtained by Professor Foster did not quite agree with the figures given in that table. In justice to himself, however, he might point out that in a number of the *American Gaslight Journal* for November, in a paper read by Mr. Lansden before the American Gaslight Association, the specific gravity and illuminating power of several gases were given which agreed fairly well with those in his own table. For example, the specific gravity of 14·02-candle gas was given as ·424; of 14·6-candle gas, as ·431; and 16·12-candle gas, as ·445. On the other hand, the highest result obtained at the Widnes Gas-Works by Professor Foster was a specific gravity of ·436 for gas of 22·4 candles illuminating power. No doubt the question of purity—the question of the freedom of the gas from carbonic acid, or the contrary, affected the result. In any case, however, it was evident, as he had already said, that they had something yet to learn on this subject. His own opinion was that the whole of these specific gravities were right. They were right for the particular gases to which they applied; and it could not by any means be said, therefore, that the specific gravity of gas of different illuminating powers was well known and settled, though this was asserted a short time back during a discussion on some statement made by Mr. Carr. He agreed with two previous speakers (Mr. Meiklejohn and Mr. Braddock) that it was unfortunate that the application of the system to a double stack had not been tried first. Except in very small works, there were no single-retort stacks; and if there were any obstacle to its being so applied, that circumstance would militate against its being widely adopted, so that an effort should be made to apply it to a double retort bench. Their thanks were due to Mr. Carr for the manner in which he had, both by illustration and description, brought the subject before them on the present occasion.

Mr. Meiklejohn said in his case the process was applied to a double bench. It was working now with four beds back to back, and would be working with eight shortly.

Mr. R. Hall (Matlock) asked how soon Mr. Duxbury expected his beds to be at work.

Mr. Duxbury replied that he thought they would be working by the commencement of the new year. In his case, he had adopted the back-to-back beds. They had used ordinary through retorts, with the middle blocked; and he had taken the jacketed pipe up through the centre of the setting.

Mr. C. Wood (Bradford) inquired whether Mr. Carr had tried the effect of passing the gas from two or three retorts through one duct. It seemed to him that in passing through it the gas from only one retort, it would remain in contact with the tar merely for a few seconds. He should also like to know whether any difference was noticed in the amount of sulphur compounds other than sulphuretted hydrogen.

Mr. Newbigging said it was desirable to say something as to the tar, because they must not go away under the impression that they had settled the question of the tar, and that the illuminating power necessarily came from the light oils. He had had two samples of tar analyzed during the past week by a very efficient analytical chemist. One was Dinsmore tar; but he did not tell the analyst which it was—indeed, he knew nothing about it. One of the samples was marked "A," and was ordinary tar, and the other was marked "B," and was Dinsmore tar. According to the analysis, the extra illuminating power of the gas came from the heavy oils, because in the Dinsmore sample there were more light oils than there were in the ordinary tar; and there was a less proportion of the heavy oils in the Dinsmore tar than in the ordinary sample. In the latter, there was aqueous liquor 1·6; in the Dinsmore tar, 10·6. Light oils, in the ordinary tar, 2·6; in the Dinsmore tar, 4·4. Heavy oils in the ordinary tar, 11·4; in the Dinsmore tar, 4·0 So there was something to be discovered yet.

Professor Foster: What are the total percentages?

Mr. Newbigging: He has not given me the totals. Those worked out add up to 15·6 for the ordinary tar, and 19·0 for the Dinsmore tar.

Professor Foster: He leaves more than 75 per cent. of the tar in the still.

Mr. Newbigging: He has not mentioned the pitch.

Mr. Braddock: Is that ordinary tar of the usual kind?

Mr. Newbigging: It is from Widnes.

Professor Foster said he had had samples of tar, and found two or three matters which he did not like to press unduly. They had not yet heard the last of the Dinsmore process, nor would all inquiry be satisfied with his own references on the present occasion

to the tar. The production of gas was clearly in all cases a function of the temperature; and there was nothing extraordinary in taking the tar, and getting gas of an illuminating power of 30 candles from it. He very well remembered the experiments of Dr. Eveleigh. The thing had been repeated over and over again, and would be repeated perhaps in the next few months. This question was not at all novel. The point was to know where to begin and where to stop, so as to avoid the troubles referred to by Mr. Newbigging. With reference to the Dinsmore tar, he did not wish to be too definite about it; he did not desire to mislead anyone. There was this fact about it—it was more viscous, and contained more pitchy material than ordinary tar. Then it was nearer the specific gravity of water, because the water seemed part of its substance, and would not rise to the surface as in ordinary tar. But when they came to the description of light oils, they were nowhere. What did they mean by light oils? He had endeavoured to work out his own case; but he did not wish to be understood as pinning his faith to the results. He obtained 3·6 volumes of light oils in the case of the Dinsmore tar, against 6·2 in ordinary tar. He could split this up to some extent—1·2 volumes came over between 74° C. and 120° C.; the boiling point of benzene being about 80° C. Between the temperatures named, he obtained as much as 3·25 volumes in the case of the ordinary tar. From 120° C. to 150° C. he procured 0·39 volumes in the case of the Dinsmore tar, and in the other, 1·3 volumes. At 150° C. and upwards—the boiling point of carbolic acid being nearly reached—he got 2 volumes from the Dinsmore tar, and only 1·6 from the ordinary tar. So that, although this analysis and that mentioned by Mr. Newbigging seemed to disagree, they both went to show that the Dinsmore tar contained more heavy oils than ordinary tar. Still the results were purely tentative and comparative. Dinsmore tar was unquestionably not so rich in benzene as naphthalene; but he did believe it contained a greater proportion of the heavy oils, and especially the carbolic and naphthalene oils up to anthracene. He had not attempted to differentiate these; and he would not ask anyone to put a money value on these things which had not been fully determined. The tar question would have to be settled by further work. As to the quantity of carbon-sulphur compounds and ammonia, he should like it at present to remain an open question. He was not sure that, with moderate temperature in the central duct, they would not get more ammonia. He was not content to believe that the process did nothing but rob the tar. Where did the extra yield of gas and hydrocarbons come from? The very increase in the quantity of gas showed there must be more free hydrogen or marsh gas, or some analogous substance. Certainly the production of hydrocarbon did proceed to some extent in the same proportions—that was to say, the extra yield of Dinsmore gas did contain more hydrocarbon; and it could only be supplied by bodies rich in both hydrogen and carbon. Marsh gas, with which they were all familiar, was always described as a non-luminous gas present in coal gas to the extent of 40 per cent. It would burn with a pale yellowish flame, giving very little light. By modifying the supply of air, marsh gas became luminous. By passing it through heated tubes, it could be made to yield acetylene and other bodies of that class. Even benzene could be produced; but it was always at the expense of some other portion of the marsh gas. If one split up marsh gas in that way, so as to get acetylene and free hydrogen, one always obtained a deposit of free carbon. He had intended to call their attention to the effect of naphthalene on the illuminating power of gas. A report worked out by Mr. Dibdin and himself gave a great deal of information as to the illuminating power of naphthalene. They made out that 5 lbs. of naphthalene was equal to 1000 cubic feet of 16-candle gas. If they added 5 lbs. of naphthalene to 10,000 feet of 16-candle gas, it would raise the illuminating power to about 17·6 candles. At all events, a very small amount of heavy hydrocarbons did enhance the illuminating power of gas very considerably. Tar was indeed a very interesting subject; and he questioned whether there was anything more fascinating to the inventor. The Dinsmore process must have its "ups and downs," according to the value of residuals. If the price of tar went up, there was not much interest in making it into gas. He was, however, satisfied that the old prices of some of the tar products were not likely to be reached in the near future, because the moment they were approached, persons having charge of immense quantities of small coal would turn their attention to the manufacture of "residuals" for their own sake.

Dr. HURTER (Widnes) said he did not come to the meeting with any intention of speaking of the Dinsmore process. He was not a gas engineer, and did not usually pay much attention to gas manufacture. They had had the benefit of hearing Professor Foster give his own explanation of his researches; and there was not much for him (Dr. Hurter) to add. Indeed, he anticipated that most of them would understand this process better than he did himself. He came there for the purpose of learning what benefits, and what difficulties, they would anticipate from the Dinsmore process. As he understood, it was simply a process for carbonizing tar; and they must understand that if they obtained a greater quantity of gas and a higher illuminating power, they would have less tar, which might or might not be of greater value. There was little doubt in his mind that some application would be found for this tar, whether or not it contained benzole. They were all obliged to use science for the purpose of making money, and had to look to each process more from the point of view of pounds, shillings, and pence, than from the purely scientific aspect; and it seemed to him that from the financial statement Mr. Carr had given, they would find this consideration played a very important part in it. The depreciated value of the Dinsmore tar was put down at £528. Suppose the tar were absolutely valueless, he did not think it made much difference; seeing there was a balance in favour of the process of £1758. If they deducted the tar, they had a margin of £1230. When they had to be satisfied with extremely small profits in other industries, a process which gave them such a saving must be worth attention. He had no right to speak with authority on this subject; for he did not understand gas manufacture, and he did not wish to do anything more than draw attention to the item of the tar in the balance-sheet. He could confirm Mr. Carr's statement as to the illuminating power. He had tested it himself in Mr. Carr's laboratory, and was satisfied that the Dinsmore gas was of the value he stated. At first he had some little doubt as to the photometer; but this had been satisfactorily explained by Professor Foster at Widnes. He could now perfectly agree that Mr. Carr's gas was decidedly better than it used to be. He was likewise told that the Widnes Gas Committee were able to put money in their bank. This after all was the best proof of the value of the process; for its success could not be denied, if they could show a money balance.

The PRESIDENT asked if Mr. Carr had ever tried the effect of passing through the duct more tar than the quantity named. Why was the limit fixed at about 4 gallons? He had not said anything on that point in the paper.

Mr. NEWBIGGING: It goes in a gaseous state.

The PRESIDENT: Was it always so?

Mr. CARR: No, not originally.

The PRESIDENT: And that is all that is absorbed?

Mr. CARR: Yes.

The PRESIDENT: It was not introduced in a gaseous state when I was there.

Mr. CARR: We were running it in in a liquid state at that time.

Mr. J. BOOTH (Southport) said he had on two occasions had the privilege of visiting Widnes, and seeing the process. On the first occasion, the old system was in operation; and the tar was run into the duct in a very small stream. On the second occasion, the arrangement shown in the plan to which Mr. Carr had referred in his paper was at work; and he approved of it much more than of the original process. In these days, the pounds, shillings, and pence question was very pressing, especially when they found the price of the raw material and wages going up so immensely. If they could only produce such results as Mr. Carr showed in his paper, there could not be two opinions as to the utility of adopting the process. They gave Mr. Carr every credit for his valuable paper; and the time he had devoted to this question. They respected him, and they respected his opinions; but they must have more detail before they felt themselves compelled to go into it. He was very glad to hear the experience of Mr. Meiklejohn and Mr. Pritchard. By-and-by they would have these two opinions strengthened in a still more practical way by Mr. Duxbury. When they had this information before them, and could show the results of the actual working of the process, they could go with confidence before their respective Committees or Boards of Directors, and place the matter in a more tangible form than they were at present able to do. When he knew that Mr. Duxbury was ready, he should visit his works, in order to see the process at work. He hoped the results which Mr. Carr showed might be fully borne out in future practical working by those who had the system in hand at present. The tests for illuminating power were, he noticed, made by the "G" Argand burner; but he questioned whether they were entitled to use that burner. If they could use the burner which would show the best results, it would be very convenient; but those of them who had local boards and other authorities to deal with could not do this. They must use the burner named in their Act; usually the "London" standard burner.

Mr. CARR: You cannot test 20-candle gas in a "London" standard burner.

Mr. NEWBIGGING: The local authority cannot object. The words are, "or other suitable burner."

The PRESIDENT said it was exceedingly difficult in a paper of this sort to grasp at once all the points which were set forth, so as to be able at the moment to put the questions which they would like to have answered. Therefore, the Committee decided to continue the discussion at the next meeting; but they thought it was better to take a portion of it at that meeting, as they anticipated the pleasure of having some of Mr. Carr's friends present; and they might have elucidated the points which struck them at the time. It was obvious that they could not offhand grasp all the matters which required elucidation; but they had had several speakers and many points were raised which he now asked Mr. Carr to reply to.

Mr. CARR began by referring to the question of the tar; saying he had hoped the analyses of the tar would have been sufficiently complete to enable some final statement to be made respecting them; but they were not. But as Dr. Hurter pointed out, if the tar was struck out altogether, it was not a question of very much moment. He had made a deduction of one-third in the commercial value of the Dinsmore tar; but he thought he had been too hard altogether in making that deduction, because, so far as the analyses had gone, they showed that for some purposes—such as creosote making—the tar would be pretty nearly as valuable as ordinary tar. He had, therefore, really made an unnecessary deduction there; but

he did not want it to be thought that he was not making every possible deduction where deductions could possibly arise. With regard to the enrichment of the gas, the President had raised the question of rich gas *versus* residual products. A few years ago carbonizing works were erected throughout the length and breadth of the country for the purpose of obtaining from coal the tar, sulphate of ammonia, and the coke; the gas being blown away. Few works could now afford to do this; and there must be some point where the gas and the residuals balanced each other.

The PRESIDENT: But they could not sell gas at 2s. per 1000 cubic feet.

Mr. CARR: They could afford to throw it away.

Mr. NEWBIGGING: After taking the value out of it—the benzole.

Mr. CARR said he had tried the thing both ways; and if anybody made out a statement, he would find there was very little difference whether their make per ton of coal was greater or less. Mr. Braddock asked about the application of the system to through retorts. The arrangement in the drawing came about through his having an old retort-house. He had a certain piece of yard-room which had to be utilized. There was not space for a through bed, or he should certainly have put one down. He had already tried this system, and brought the outlet up through the centre of the arch. This was somewhat objectionable; but Mr. Pritchard, as he understood, was working with a retort fitted with a diaphragm which left the retort-stack altogether undisturbed. The process could in that way be as well applied to through retorts, as it could be to single retorts. In his own case, its application to single retorts came about through the accident that he had this piece of land. Then Mr. Meiklejohn raised an objection to the heavy seal on the dip-pipes. This, of course, was an objection; but when it was considered that the charges were of six hours each, and that the gas was not passing for more than two minutes out of these six hours, the objection was not a very serious one. The time taken was only while the man was closing the door and opening the tap; and it need not be so long as two minutes. With the arrangement described, a heavy seal was necessary, in order to ensure the gas passing through the duct. Mr. Wood asked if he had tried the effect of passing the gas from a less number of retorts through the duct. He had not; but he fancied he knew what the effect would be. It was well known that the bulk of the gas was given off in the first hour; so if there were only two retorts to each duct, the result would be that, in the first hour, the duct would have work to do, and in the next two hours, it would have none. The consequence would be that the heat of the duct would be increased; and the gas would be depreciated in value. He believed it was owing to this arrangement, of having six retorts and charging one each hour (thus keeping up a regular flow of gas through the duct), that they had the results which had been obtained. If they were to charge two retorts at once, there would be a great rush of gas; the tar would not have time to become fixed; and then towards the end of the two hours, there would be scarcely any passing, and the gas would become attenuated, instead of being improved. Mr. Wood also asked if they experienced any difference in the sulphur compounds other than sulphuretted hydrogen. They found a reduction in them. He was not at present prepared to say how this came about; but such was the case. He should like to add that they had had no increase in the leakage. It had been said that this gas would condense in the mains; but they had not found such a result. The leakage account did not increase, and this fact might be taken as evidence of the permanence of the gas.

Mr. DUXBURY said their thanks were, in a special manner, due to Mr. Carr for the way in which he had brought this matter before them. He had given a great amount of time and attention to the subject; and it was only fair that he should reap some benefit from the process. He (Mr. Duxbury) hoped he would. As Mr. Newbigging had pointed out, attempts had been made on many previous occasions to get permanent gas from tar; and if Mr. Carr and those associated with him, had hit upon the right process now, they should have the credit of it. At any rate, they were thankful to him for reading the paper; and he begged to move that their thanks be formally expressed.

Mr. MEIKLEJOHN said he had great pleasure in seconding the proposition. He wished to add that if the arrangement he had attempted yielded the same results as Mr. Carr's, he should, as a matter of sentiment, prefer it.

Mr. DUXBURY suggested that it would greatly facilitate the comparison of results if those who were experimenting or trying the system could use the same burners for testing the gas. Personally, he employed the "London" standard Argand; but he did not always get the best results from it. He realized better results by using a flat-flame burner.

The PRESIDENT, in supporting the resolution, referred to the question of the difference in the value of the tar; and said this was a subject deserving of very careful attention. No two gas-works were in exactly the same circumstances with regard to the disposal of their products, whether gas or residuals. He did not at all agree with the way in which Mr. Carr had put the statement of account between the two processes; but he had given them material with which to form their own opinion, and place their own values upon. The paper was admirably put together, and lucid enough for anyone to comprehend with careful reading. They were very much indebted to Mr. Carr for the trouble he had taken in the matter; and for bringing with him gentlemen interested in the process who had given considerable time to the investigation of the various points involved in it.

The resolution was carried with applause.

Mr. CARR said that, although he was very much obliged to them for the vote of thanks, the point mentioned by the President with reference to the financial statement was of such importance that they might, with some benefit, continue the discussion a little further and endeavour to have the matter settled. He did not see where he was wrong; and if either the President or any other gentleman would show him, he should be very glad. It had been his effort all through not to deceive himself; and if he was doing so, he wished to be set right. The question of the burner mentioned by Mr. Duxbury was not very important in one sense. When he stated a result, he named the burner; and anyone could obtain the same burner from Sugg, compare it with his own, and find the result.

The PRESIDENT explained that he objected to Mr. Carr taking the gas at the selling price. The cost of production was the ruling factor—the price at which the gas could be put into the holder, and not the selling price of it.

Mr. CARR: Would you include in that the standing charges and all incidental expenses?

The PRESIDENT: The cost of the gas in the holder.

Mr. CARR: You can have it exclusive of the standing charges, or inclusive of them.

The PRESIDENT: Whatever it cost to produce, would be the amount.

Mr. CARR: That would then mean that the cost of purification should be added here.

The PRESIDENT: You put it here at 2s. per 1000 cubic feet.

Mr. CARR: I do not see that that would affect the balance.

The PRESIDENT: You would find it would if you worked it out.

Mr. CARR: The Dinsmore process does not affect the other portion of the works. This statement refers to that portion of the plant or production which the Dinsmore process affects. If it will increase the cost of the gas in the holder, how and where is it?

The PRESIDENT: It will increase the cost in the holder, because you must have more plant—more holder accommodation—to begin with. If you only get 9600 cubic feet in one case and 10,600 cubic feet in another, you must have more plant.

Mr. CARR: Yes, there would be a small addition there; but beyond that, I do not see any point that could possibly arise.

The PRESIDENT: You have the extra cost of labour.

Mr. CARR: I have that down here.

Mr. BOOTH: You value the whole of the gas made without reckoning leakage.

Mr. NEWBIGGING: He is comparing the two processes in the works. It has nothing to do with the leakage.

The PRESIDENT suggested that as the hour was getting late, the discussion should be postponed.

Mr. CARR then expressed his acknowledgment of the vote of thanks.

VARIATIONS IN THE PRODUCTS OF THE DESTRUCTIVE DISTILLATION OF DIFFERENT GAS COALS.

At the Meeting of the London Section of the Society of Chemical Industry, at Burlington House, Piccadilly, yesterday week, Mr. WATSON SMITH, Lecturer in Chemical Technology in the University College, London, read a paper entitled "Some Notes on Variations in the Products of the Destructive Distillation of Different Gas Coals, Heated Separately in the Same Retort and under Similar Conditions." The following is an abstract of the communication in question:—

The author first of all directed attention to the "naphthalene nuisance"—a term which, as he truly said, is perfectly understood by every gas maker. Speaking of the cause of the nuisance, he referred to a case which came under his observation, in which a large heap of cannel was pointed out to him as having been exposed to a hot sun for some weeks; and it was suggested that coal thus air and sun dried, would, at the high temperature of carbonization, suffer a more drastic carbonizing than coal in the usual condition of dampness, and hence give off more naphthalene. This deduction of his informant was plausible, though he imagined that all steam derived from hygroscopic moisture would have left the retorts before the formation of naphthalene could take place to any extent. But in any case the fresh charge of coal must cool the retort somewhat; and the formation of steam from moisture would certainly delay the rise of temperature to that usual as the full carbonizing heat. Hence if they took it that a coal, on the average, containing a certain amount of moisture was carbonized and yielded gas of the usual quality, and not excessively burdened with naphthalene, a coal of the same kind, but well desiccated, would suffer a more prolonged intense heat, though the firing arrangements remained constant; and the heat thus attained and prolonged might suffice to materially increase the naphthalene formed. But the hot weather and sun which caused the desiccation of coal exposed to them would also detract greatly from the efficiency of the atmospheric condensers, and would tend to warm up the rest of the apparatus; and if the supply of water to the scrubbers ran temporarily short, or if the usual and normal condensation by cooling were suspended for a time, then great risk was run of naphthalene being carried by the flow of gas into the mains in dangerous abundance; for they had a general concurrence of circumstances favouring deficiency of condensation. This was what he believed occurred in the case in question which came under his notice. When a certain ratio existed between naphthalene and the vapours of liquid hydrocarbons, and

especially of those of carbolic acid and other phenols, he had found the naphthalene would not sublime and deposit in crystals. It seemed as if, at the moment of the formation of a minute crystal by sublimation and condensation, a minute quantity of naphtha was also condensed upon this point, and the crystal vanished, so to say, at the moment of formation; and a minute drop containing the naphthalene in solution was the result. But if the proportion of naphthalene increased, a point would be attained at which its sublimation became possible, and condensation in crystals followed. There was no doubt that inefficient and insufficient cooling of the gas before its entry into the mains was a prolific cause of the napththalene difficulty. It was also clear that, if the gasholders were not sufficiently large for the supply of gas required, and also to allow a certain reserve, proportionately larger for gases more troubled with naphthalene, then the settling and deposition of the naphthalene sublimate from the gas could never take place; for whilst there was a continual inrush of the gas, there would also be a continual outrush. Moreover the gas would be warm. If the entire plant was small in proportion to the demand for gas, not only would there be an excessive strain upon it, but the holder space would be too small during any such strain, and then the gas would be delivered after insufficient condensation and settling. During hot weather sufficient condensation therefore became almost impossible. Concluding this part of the paper, he laid stress on the following points, which, he said, required attention to prevent the napthalene nuisance:—(1) The quality of the coals used and the coal mixtures; also the heat of carbonization. (2) The cooling and condensation of the gas. (3) The proportion of the plant to the gas supply required. (4) The proportion of the storeage space to the gas generated and supplied. Concerning the benefit of using a mixture of coals containing a good proportion of cannel, which on distillation always yielded very liquid tars, the author said that vapours condensing to such liquid products washed or scrubbed down the naphthalene from the vapours of tars otherwise rich in naphthalene and proceeding from other than true cannels in the coal mixture used.

Turning to the question as to why naphthalene caused stoppages in service-pipes, chiefly in the winter, the author said—supposing naphthalene, through insufficient condensation and cooling in summer, was carried into the mains—a hot summer would mean plenty of daylight, and little gas consumption; and hence only a slow current of gas in the mains. But in the winter, there would be a rapid current of gas. If then the accumulated naphthalene were imagined lying about like snow-drifts, whilst a slow current would not disturb them materially, at the period when some tens of thousands of gas-burners were lit up in the winter, they might fancy something like a "gust" of gas carrying along the naphthalene crystals farther and farther into the service-pipes, and at last causing stoppages in them.

The statement made to the author, to the effect that coals differed as to the amounts of naphthalene contained in them, led him to consider whether it might not be possible that different coals, carbonized under like conditions, yielded varying amounts of naphthalene and also other products. This idea formed the basis of a series of experiments that was proposed to a large gas company whose customers were plagued by naphthalene. The company had an experimental plant; the retorts being of cast iron. The proposal was to carbonize 5 cwt. of each kind of coal used separately, in order to collect the gas, tar, and liquor, and to send to him (Mr. Smith) a sample of each tar in which he was to determine the amount of naphthalene. Each variety of coal of seventeen different kinds was thus treated, representing the typical cannels and gas-producing coals in the northern coal-fields of England. All these coals passed under the same treatment and through the same retort, so that the conditions as to temperature of distillation might be regarded as identical. Many people were not aware of the great influence which the physical or chemico-physical properties (for lack of a better term) of different coals had upon the products of their destructive distillation. Supposing a gas-retort charged with an ordinary bituminous coal, not distinctly a cannel, but approaching it, and destructive distillation to follow, and again supposing it were charged with pronounced cannel coal, and again carbonized precisely as in the former case, or at a still more elevated temperature—in the first case they would get a tar high in specific gravity and rich in naphthalene and anthracene, but deficient in paraffins and middle oils. In the second case the specific gravity of the tar would be low; paraffins would be plentiful, to the detriment of the anthracene; and anthracene and napthalene, scarce. Moreover, the light naphthas with middle oils would be plentiful. The specific gravity of the rectified benzenes in the first case would be ·880 to ·890; but in the second it might be about ·870, or even lower. In the first case the creosote oil would, on cooling, partially solidify from crystallization of naphthalene; in the second case, even on cooling, crystallization might not take place. A sample of the clear reddish oil distilled, and the latter small portion taken, boiling at 210° to 250°, might solidify on cooling; but it would present, the appearance of a greasy thick mass without much crystalline appearance and contain a mixture of naphthalene and paraffin. He (Mr. Smith) well remembered the time when Gräbe and Liebermann's great synthesis of artificial alizarin was first effected. He was then Chemical Manager of a tar distillery near Manchester; and he recollected the trouble caused by the anthracenes obtained from the tar of the gas-works of the Manchester Corporation, where Wigan cannel was principally used. The difficulty was only overcome by mixing less bituminous coals with the cannels for charging the retorts.

Adverting to the investigations with which the paper mainly dealt, Mr. Smith observed that as soon as they learn that not only did variation of temperature of destructive distillation affect the yields and characters of products, but also variations in the physical characters of the coals used, they became impressed with the fact that the question was a more complex one than might have at first sight appeared. With regard to the coals employed, there were 17 varieties, the results of his experiments with which (in 1887) he tabulated as follows:—

Number of Sample.	Yield of Gas per Ton. Cubic Feet.	Illuminating Power. Candles.	Ammoniacal Liquor.		Tar.		Actual Sp. Gr. of Tar.	Percentage of Naphthalene.
			Gallons.	Sp. Gr. Deg. Twaddel.	Gallons.	Sp. Gr. Deg. Twaddel.		
1	10,442	15·16	20·0	2	..	36	1·191	4·67
2	9,920	27·70	21·3	3	11·8	34	1·182	3·94
3	10,826	24·23	18·6	2·5	11·1	32	1·175	4·85
4	10,590	14·22	12·3	4	9·1	37	1·186	4·06
5	10,716	15·13	12·0	4	8·1	36	1·196	5·32
6	10,890	14·68	13·3	3·5	10·0	37	1·201	6·00
7	10,786	14·92	16·6	4·5	10·5	36	1·193	5·39
8	10,733	14·76	15·0	3·5	9·3	36	1·190	5·20
9	10,906	14·51	12·0	4	7·5	36	1·187	3·53
10	10,200	15·71	17·3	4·5	12·6	34	1·177	4·00
11	10,946	14·63	13·3	4·5	9·0	35	1·186	4·56
12	10,333	15·44	14·6	4	10·0	35	1·187	5·26
13	10,760	14·99	15·0	3·5	9·2	35	1·180	4·63
14	9,666	26·78	25·6	3	14·8	30	1·170	4·13
15	10,280	25·06	26·0	4	14·6	29	1·167	3·18
16	9,746	25·97	27·0	3·5	14·0	31	1·164	2·68
17	9,333	29·09	22·3	3·5	10·8	31	1·147	3·15

The author directed attention to the figures in the table for specific gravity and percentage of naphthalene, which showed, he said, that they fitted together remarkably well—rising and falling together. This he more clearly indicated by a table, in which the specific gravities were placed in order of magnitude; and it was seen that, as these numbers rose, so the figures representing the naphthalene rose—not precisely in all cases, but very nearly so. For the specific gravities of the tars at the works, Twaddel's hydrometer was used; but Mr. Smith weighed a known volume of each tar—viz., 700 cubic centimetres—at a time. The second mode might, remarked the author, be taken as being about accurate; and he pointed out that the figures showed, on comparison with the Twaddel degrees, how very inaccurate a method of determining the specific gravity of so thick a fluid it was to use the hydrometer. It would be observed from the table that the coal which, whilst emitting at the given temperature a good volume of gas of excellent illuminating power, yielded also a minimum of naphthalene, was No. 15. It was clear from the results given that—(1) Good condensation must be adopted and maintained uniformly if naphthalene in dangerous preponderance was to be kept out of the gas. (2) That it was possible to select a gas coal or mixture of gas coals which would, other circumstances being equal, yield, with a good illuminating gas, a fair minimum of naphthalene. (3) That in the specific gravity of the tar produced, a fair criterion was afforded as to the amount of naphthalene present in the tar. He was here referring exclusively, of course, to benzenoid tars.

Speaking of the effect of carbonizing at high temperatures irrespective of the quality of the gas coal, Mr. Smith alluded to the results of experiments embodied in the paper read by Mr. Lewis T. Wright before the Society in 1888.* In that paper was given an analysis of a tar obtained from a mixture of Yorkshire and Derbyshire coal distilled at a high temperature (specific gravity of the tar, 1·23). The results of distilling the tar were as follows:—

	Per Cent.
Ammoniacal liquor	4·39
Crude naphtha	4·11
Light oil	—
Creosote oil	18·99
Anthracene oil	12·14
Pitch	59·14
	98·77

* See JOURNAL, Vol. LI., p. 281.

Mr. Wright observed in his paper: "Here the light oils are practically absent; and as soon as the crude naphtha (rich in benzenes) had come over, solid naphthalene made its appearance." The author's examination of tar (specific gravity 1·2) produced from Staffordshire coal carbonized at a high temperature in Simon-Carvès coke ovens, gave the following results:—

	Per Cent.
Ammoniacal liquor	4·39
Crude naphtha (sp. gr. ·950)	9·70
Distilling over, below but up to 300° C. { Light oils	—
Distilling over, below but up to 300° C. { Creosote oils	22·70
Above 300° C. (Anthracene oil)	10·70
Pitch	52·51
	100·00

Thus there were no light oils, and scarcely any heavy oils; for the so-called creosote oil was a greasy solid, or semi-solid, mass of crude naphthalene. The anthracene "oil" was also a semi-solid thick mass. No doubt, continued the author, the temperature here had even exceeded that employed by Mr. Wright in carbonizing his coal. The similarity of results was somewhat conspicuous; and the tendency of *yet higher temperatures* had been to still further accentuate the absence of oils—both creosote oils and anthracene oils, as well as ordinary light and heavy oils. Other differences in results would be due to the different qualities of the coals carbonized. The crude naphtha obtained as above, and of specific gravity ·950, yielded 79·5 per cent. by volume of naphtha, and 2·16 per cent. of crude carbolic acid, or 0·14 per cent. on the tar. He could thus by these results of his confirm Mr. Wright's observation as to the *apparent* diminution of the tar acids (phenolic bodies), as well as middle oils, to increase of temperature; and gas-retort tar generally contained 0·5 per cent. of crude carbolic acid, as against the 0·14 per cent. he obtained in the Simon-Carvès oven product. Probably though, as he had yet to show, neither Mr. Wright nor himself sought for the carbolic acid in the right oils in the above cases; and they did not obtain all there was in such case. The other results with the crude naphtha were:—

Temperature. Cent.		Per Cent. by Volume.	
Below 100°	..	1·36	
„ 110°	..	8·84	63·29
„ 150°	..	38·09	
„ 200°	..	15·00	
Above 200°	..	36·71 (chiefly naphthalene).	
		100·00	

Alluding again to the table, it would be seen, said the author, that great variations in the quantities of tar occurred, which could not be fully explained by any reference to either volumes of gas obtained, the illuminating power of the same, or by reference to the specific gravities of the tars, or the amounts of naphthalene—whether any of these were taken singly or in conjunction. He took it therefore that the volumes of tar obtained (the carbonizing heats being about the same) were functions of the physical and chemical conditions of the coals employed; and hence they might say that, in carbonizing coal for the sake of aromatic tars, a selection of a special coal among many kinds of coal might be reasonably sought for. They found in the table, for example, that whilst No. 9 yielded only 7·5 gallons of tar per ton, of specific gravity 1·187, No. 14 gave 14·8 gallons of specific gravity 1·170—*i.e.*, nearly double the amount. If the table was arranged in the order of the specific gravity of the tars obtained, a curious fact was brought out—viz., that whilst the tar of lowest specific gravity corresponded to the smallest volume of gas obtained of highest candle power, yet it had not followed that naphthalene should be present in least percentage in that tar, nor had it followed that the tar should be smallest in percentage amount on that coal. Nevertheless, the yield of tar was good in this case; and the amount of naphthalene was smallest in amount, save in one case. It would seem that some coals might be carbonized at a high temperature, and a large volume of gas obtained of rather low illuminating power. A considerable volume of tar containing much naphthalene might also be obtained, and so a thick tar. In short, it would appear that some coals had a greater tendency at high temperatures to produce naphthalene and similar high boiling hydrocarbons (naphthalene and anthracene, he mentioned, stood together in these remarks) than others, whose tendency was to be more refractory on destructive distillation in this respect, and by preference to form bodies of the phenolic type and benzene hydrocarbons—the phenolic bodies breaking up in accordance with Schulze's hypothesis, into benzene and other hydrocarbons; and these or some of them probably passing off more largely with the gas, increasing its illuminating power, as seen in the table. It must, he said, be plain that, on the whole, the thinner tars—hence containing bodies of lower specific gravity—corresponded to the gases of highest illuminating power collaterally produced. These thin tars were always characteristic of the true cannel coals, such as the Wigan cannel; and they knew that such coals yielded high illuminating gas. What would strike them most in the table was that, in spite of the variations referred to, they saw strong evidences of the general rule that, with a tar of moderate specific gravity (1·16 to 1·17), they had a large yield of that tar, a good yield of gas of high illuminating power, and a moderate amount of naphthalene, with doubtless a good yield of anthracene, and a fair amount of benzene and carbolic acid; whilst with one of high specific gravity, the gaseous volume was larger, illuminating power smaller, naphthalene and anthracene larger, and the amount of tar obtained smaller. The special deviations from the rule the author believed indicated differences in the properties of the different coals used, and showed that within the general rule there was room for selective improvements and advantage.

The concluding portion of the paper consisted of "a more special consideration of the tar constituents." By distilling off the crude naphtha and light oil, including some creosote oil, and measuring them, the amounts of these constituents were determined. As crude naphtha, all that coming over on distillation below 180° C. was measured. As to the remaining oil, it might be said that it consisted of light oils, including some heavy oils, and the bulk of it sank in water. The amounts were measured, and were given in a table by the author, so as to follow with the specific gravities of the tars taken in increasing order. It was seen thereby that as the tar rose in specific gravity, there was clearly a tendency to a falling off in the quantity of crude naphtha and of light oils; but variations were very perceptible, depending, no doubt, on the varieties of coal carbonized.

The following figures are taken from the table alluded to, and the other particulars referring to the various samples will be found in the first tabulated statement:—

No. of Sample.	Gallons per Ton of Tar. Light Oils Distilling Below 180°. Crude Naphtha.		Above 180°. Heavy Oil for Carbolic Acid.	No. of Sample.	Gallons per Ton of Tar. Light Oils Distilling Below 180°. Crude Naphtha.		Above 180°. Heavy Oil for Carbolic Acid.
17	7·4	..	21·5	4	3·8	..	20·5
16	8·4	..	21·0	9	5·3	..	13·7
15	1·4	..	26·4	12	4·1	..	19·0
14	5·0	..	21·5	8	2·1	..	17·0
3	6·0	..	23·0	1	3·2	..	5·6
10	7·1	..	30·0	7	4·5	..	15·5
12	4·2	..	18·0	5	5·0	..	16·0
2	7·1	..	11·6	6	4·0	..	13·3
11	1·4	..	21·5				

In conclusion, Mr. Smith thanked his assistant (Mr. Hamilton) for the intelligent help he rendered in carrying out most of the experiments reviewed in the paper.

The CHAIRMAN (Mr. David Howard) said he had to thank Mr. Smith for his valuable contribution to the subject of the chemistry of gas production. This was one of the most complex questions one could deal with. It would be sufficiently difficult to grasp the entire problem were there only one series of homologues; but where there was a re-action which produced several series of homologues, the number of unknown quantities in the equation became perplexing—almost beyond solution. Those of them who had had any experience with naphthalene in pipes would have a very keen idea of its nuisance, as it always appeared to find out the most awkward points. It was a very interesting question, and one which he did not think had been fully worked out—the influence of the solubility of one gas constituent upon another in vapour. It appeared to him that, speaking generally, they might have a gas containing more than one series of the homologues of different series retaining one another in solution of vapour, while the homologues of the same series tended to turn one another out. There was evidently some complication of the laws of the solubility of gases in vapours. This might perhaps explain why the analysis of gas varied so enormously. They would find, for instance, that in the coal gas of Paris, London, and Manchester, the proportion of volatile constituents which were in it varied so extraordinarily much that the Paris analyses had been frequently challenged on the ground that they were impossible.

Discussion was invited, but no one responded. The Chairman, however, said he hoped the paper would be discussed on a future occasion, after the members had had an opportunity of considering the questions dealt with.

AMERICAN GASLIGHT ASSOCIATION.

[Abridged from the "Official Report" in the *American Gaslight Journal*.]

(*Concluded from p.* 1017.)

At the close of the discussion on Mr. Young's paper on "Fuel Gas," Mr. H. W. Pearson read a paper on "The Conduct of the Electric Light Business in Connection with the Gas Industry," the full text of which has already been given in the JOURNAL (see *ante*, p. 877). It was followed by a discussion, in the course of which Mr. R. Young questioned whether, where an electric light undertaking is already established, a gas company could successfully compete with it by saddling an electric light plant on their own works. It seemed to him that such an increase of competition would only have a tendency to reduce the cost of electric lighting; and this would affect the price of gas. Of course, where there was no electric light, it was better for the gas company to take it up than to allow a competing company to do so. Mr. Stiness desired to take issue on this point. Although not advisable in all cases, there were, he said, circumstances which rendered it advisable for a gas company to compete in electric lighting with an existing electric light company. He knew by experience that many companies were doing a successful business in supplying gas, arc, or incandescent light, as required. The electric light business in Massachusetts was rapidly increasing; and he knew that in many instances it was being carried on at a profit. Mr. Pearson had spoken of £70 per annum being charged for an arc light; but he (Mr. Stiness) would like to do it at one-third the price, and guarantee a 10 per cent. dividend. For an arc light used all night, 1s. 8d. per night was a good paying price. In his experience, the depreciation on electric lighting appliances was much less than that on the property of gas companies. He believed that there were many places where the businesses of electric lighting and gas lighting could be

profitably carried on by one company, and that it was best for gas companies to control all means of artificial lighting that were not used by the wick. Mr. Littlehales agreed as to the desirability of a gas company taking up electric lighting, even where another concern was in possession, because in many cases the electric light had been started by speculators, and the plant had cost three times as much as it should have done. In addition to this, great progress had lately been made with appliances, so that a gas company or anyone else could buy a plant of any given capacity for half what it would have cost seven or eight years ago. Mr. R. Young remarked that even then the competition would be at the expense of the gas interest. He would be inclined to leave the company with a large capital alone, as they would probably be willing to lose a good deal before giving up. Mr. R. Baxter was glad to find so many coming round to the position he took up some time ago—that if the public want the electric light they ought to have it; and who, he asked, could furnish it to them so cheaply and efficiently as a gas company? Under certain circumstances, it might be advisable for the gas company to supply it at a low price, and so keep out speculators, whose ultimate object was to injure the gas business. Mr. M'Millin was delighted to see with what facility gas companies could adapt themselves to the changed conditions of the times. Most of them now agreed that the electric light was a good thing to take up. At St. Louis, five electric light companies were formed, and afterwards united; and himself, and other shareholders of the gas company, had bought up the united company in their individual capacity. One of the companies had made 20, and another 18 per cent. profit during the past year. They supplied chiefly by contract, and probably received 2s. 2d. per month for incandescent lights. Another company charged 2s. 1d. per night for arc lights. For railroads he believed the charge was about £17 per annum on the "moonlight" scale, or £24 per annum for all-night use. Some of the low prices they heard of were undoubtedly fixed at a loss, to keep other people out. He agreed with Mr. Pearson that an arc light at 1s. 8d. per night was as good as gas at 4s. 2d. per 1000 cubic feet.

A paper on "The Advantages of Supplying a Mixture of Coal and Water Gas" was next read by Mr. T. G. Landsen (Washington). He began by pointing out that a great disadvantage incurred by those who supply this kind of gas was the absence of any official recognition of a standard burner, either for water or for mixed gases. Sometimes it was stated that the gas should be tested by the burner best adapted to it; but this left the question to the judgment of the local gas inspector. Between the burner used as a standard in New York and that adopted in Washington there was a difference of something like 6½ candles. The jet photometer, unreliable for coal gas, was vastly more so in the case of water or mixed gases. In the absence of any recognized standard burner for water or mixed gases, he had used a Bray's slit No. 7 for his experiments. In localities where the consumption was subject to much fluctuation, it was necessary to have a sufficient number of benches under fire to meet the largest demand; and they could not all be kept continuously at work. But with a water gas plant in addition, the coal benches could be kept working at their full capacity, as the water gas would meet the fluctuations. Another advantage of the mixed gas was that the quality could be adjusted to any standard. It was impossible to furnish pure coal gas of 18-candle power or higher that would give entire satisfaction. Probably 90 per cent. of the gas was used in flat-flame burners, and when 18-candle power was exceeded consumers complained that the gas smoked. But a higher quality of mixed gas could be supplied without trouble from this source. No doubt much of the fault lay with the consumers; and if they would not take care of simple batswing or fishtail burners, what could be expected of the more complicated forms of burners that were now being introduced? In these days of electricity, the eyes of the people were educated up to the demand for a higher quality of gas; and the gas companies would have to furnish it. Another advantage was the possibility of reducing the stock in the coke-yard whenever circumstances demanded it. He had tried some experiments as to the heating value of the two kinds of gases; using a double-ring Bunsen burner and a small galvanized iron tank containing a cubic foot of water. A coal gas of ·431 sp. gr. and 14·6-candle power, burning at the rate of 9 cubic feet per hour, raised the temperature of the water 8·4° for each cubic foot of gas burnt. Another sample, of ·445 sp. gr. and 16·1-candle power, raised the water 8° per cubic foot of gas. A carburetted water gas of 28-candle power and ·584 sp. gr., burning at a similar rate, raised the temperature 9° per cubic foot. A second sample gave a like result. A mixure composed of half coal gas of 16·1-candle quality and ·445 sp. gr., and carburetted water gas of 27-candle quality and ·567 sp. gr., was next tried, and found to give a result represented by the average composition. After standing for three hours, the first gas that escaped from the holder had an illuminating value of 23·3 candles; the last, 20·8 candles—giving an average of 22 candles, or about 0·5 candle more than that of the gases when separate. A second experiment with a mixture of equal parts of carburetted water gas of ·522 sp. gr. and 23·1-candle quality, and coal gas of ·424 sp. gr. and 14-candle power, gave still more marked results. The quality of the mixture, as indicated by the composition, should be 18·6 candles; but the average of five tests gave a result of 20·6 candles—showing a gain of 2 candles by the admixture. Uncarburetted water gas, tested for heating as above, gave 4·1° increase of temperature for each cubic foot of gas consumed, or only one-half that of the other gases. From this it followed that if water gas were sold as a fuel, it would require a plant twice the size; and that water gas at 1s. 8d. per 1000 cubic feet would not be any cheaper than illuminating gas at double the price. He considered the most satisfactory gas of the future would be a mixture of 60 per cent. of coal gas and 40 per cent. of water gas. It had been said that the two gases would not mix, but would stratify in the holder. Such had not been his experience. The gases at his works were entirely separate and distinct till they met at the inlet of the holder. In one case the mixed gas had stood in a holder for two months; but when used it was quite equal in quality all through.

In the discussion on the paper, Mr. R. Young inquired whether the same burner was used throughout the heating experiments. The same burner would not be suitable for both 16 and 29 candle gas; and this might, he said, account for the apparent accordance in heating value. He quite agreed as to the advantage of using mixed gases; and at Allegheny he was following this plan. He had plant for both coal gas and water gas; and the proportion of the latter in the mixture ranged from 25 to 75 per cent., according to the season—being highest in summer and lowest in winter. His water gas was not exactly pure water gas, but consisted of two parts of this and one part of natural gas. He had no trouble from stratification; and he agreed that the mixed gas, averaging 18½ to 19 candle power, was better, and more satisfactory to the consumer, than 16-candle coal gas. He had tried to improve the coal gas to 20-candle power by the use of oil as an enricher; but found great complaint about discolouring walls and ceilings. Since he had taken to water gas, however, there had not been a single complaint of this sort. Mr. Cowdery said he had tried experiments on the same lines as Mr. Landsen, and arrived at similar results. Mr. A. C. Humphreys said that gases would not stratify if they were allowed time to mix; if they had a proper chance, they would mingle thoroughly. But he preferred to mix the gases at the exhauster rather than at the holder inlet, for the simple reason that the elaborate system of double purifying plant was thus avoided. They could be brought together and mixed in any desired proportion by the use of only one exhauster.

Professor E. G. Love next read an interesting paper on "Gas Calorimetry;" describing the various methods of measuring heat, and the calorimeters designed respectively by Andrews, Favre and Silbermann, and F. W. Hartley, and concluding with a table of the calorific powers of gases based upon the results of Professor Julius Thomsen.

Mr. F. H. Shelton followed with a paper entitled "Water Gas, Past and Present." He gave an account of the earlier history of water gas, and a description, illustrated by diagrams, of the Sanders, the Gwynne or Allen-Harris, the Salisbury or Slade, and the Jerzmanowski ("boot-leg" or "baby") forms of apparatus, all of which are based on the retort system; of the Tessié du Motay, the Wilkinson, the Jerzmanowski, the Hanlon and Johnson, the Edgerton, the Harkness, the Mackenzie, the Egner, and the Meeze apparatus, which include generators in which a non-luminous gas is first made, and afterwards carburetted in a second apparatus; and of the Lowe, the Granger, the Hanlon-Leadley, the Springer, the M'Kay-Critchlow, the Flannery, the Martin, the Pratt and Ryan, the Van Steenbergh,* and the Loomis apparatus, consisting of generators in which water gas is made, carburetted, and fixed at one operation. In conclusion, he showed by a diagram that the use of water gas has greatly increased in the States during the past few years, and that, out of about 1100 towns, 305 have adopted water gas. The principal forms of apparatus used in practice are the Lowe, Granger, Springer, and M'Kay-Critchlow, all of which belong to the last class above named.

The concluding paper was the one by Mr. C. L. Rowland, of the Continental Iron-Works, Brooklyn, on the "Operation and Care of Gasholders," which has already been given (see *ante*, p. 879). The reading of the paper was followed by a short discussion.

Attention was then directed to the question-box. In replying to the question, "Where should the gas company's ownership of the service-pipe terminate—at the street kerb, lot-line, or meter?" Mr. Taber spoke emphatically in favour of the last; saying that, in these days of competition, it was best to be a little less cautious and more liberal. He had found this in regard to coke. When the buyer had to load and cart away the coke at his own expense, none worth speaking of was sold; but when his Company (New Bedford, Mass.) had their own waggons and carters, they could sell as much as they pleased. Of course, if the service was unusually long, a charge could be made. Mr. Boardman said there was another very strong reason why the suppliers should own the whole of the service. Not only could they protect themselves against leakage, but could stop an opposition company from using the service. A householder would give the manager a chance to talk to him after the opposition had seen him, rather than suffer the inconvenience of having his side walk torn up to lay a new service. The President said his practice was to supply the service and fix the meter without any charge whatever. On the subject of "allowing a special discount for gas used for heating or cooking," Mr. Scriver claimed that the Montreal Gas Company were the first to introduce a special reduction on gas employed for other than lighting purposes. They had allowed a special discount of about 33⅓ per cent. for the last ten years, and considered that this had proved greatly to their advantage. At present they supplied about 90 million cubic feet of gas per annum, or one-fifth of their total make, on these terms. Mr. Pearson said that after about eight years'

* This is the process described in the article which appeared in the JOURNAL for the 26th ult. (p. 1007).—ED. J. G. L.

experience of the plan, he found it had been the means of greatly increasing his consumption. He had now something like 1500 stoves and fires supplied at the special rate. Mr. Scriver added that his Company made their own gas-stoves, and sold them at a very small profit, besides fixing them free of charge.

Register of Patents.

PURIFICATION OF GAS.—Kusnezoff, W., of St. Petersburg. No. 13,074; Sept. 10, 1888. [6d.]

This invention specially refers to a cooler or condenser for purifying gas obtained from naphtha (crude petroleum).

The cooler consists of a metallic casing (having the form of a parallelopiped) divided by a horizontal partition or plate in two compartments communicating with each other only by a vertical pipe or duct. The lower chamber, into which the gas to be purified enters by an opening, is filled up with vertical partitions, which cross each other at right angles, and form a great number of vertical channels or ducts (say, from 64 to 500), communicating with each other alternately at the bottom of the casing above the level of the water contained therein, and under the horizontal partition. By this arrangement, the gas must pass consecutively through all the vertical channels of the lower chamber. The vertical partitions beginning at some distance from the plate do not reach the bottom of the casing; so that the water is at the same level in all the channels. In passing under the lower edges of the vertical partitions, the gas is brought into contact with the water, which retains the particles of naphtha contained therein (and which may have escaped the hydraulic main), and thus cools the gas. After passing through all the channels of the lower chamber, the gas ascends into the upper chamber, which is filled with water to one-third of its height. In the upper chamber there are a number of metallic partitions parallel to each other, which form a serpentine-like channel, where the gas is finally purified and discharged from the apparatus.

BILLIARD-TABLE LIGHTS.—Thorp, T., of Whitefield, Lancs. No. 18,133 Dec. 12, 1888. [6d.]

In applying these improvements to billiard-table lighting, the patentee proposes to make use of (say) four ordinary gas-burners placed horizontally or nearly so, and screwed into the gas-supply pipe in the usual manner. To the pipe in which the burner is screwed, there is attached a stout metal plate or elbow projecting in an upward direction, but at an angle of about 40° towards the burner. To the upper end of this plate is fitted a truncated sheet metal cone, enamelled or otherwise whitened on its interior. The hole in the top of the truncated cone is preferably about 1¼ inches in diameter. Resting on the top of the cone, and secured to it by clips bent round its under edge, is the shade rest formed of wire so as to leave about 1 inch of space all round between the shade and the cone. When the gas is lighted, the usual uprush to the flame is prevented by the hole at the top of the truncated cone being of only about sufficient area to allow the products of combustion to pass. This keeps the flame steady; and as the interior of the cone is reflective, the illuminating effect is greater than with only the ordinary shade. In order to regulate the supply of gas to the burner, a screw is fitted into the side of the connecting socket in such a manner that the internal passage can be opened or closed at will.

GUIDING AND CONTROLLING GASHOLDERS.—Pease, E. L., of Darlington. No. 18,272; Dec. 14, 1888. [1s. 3d.]

The general features of this invention were described in the JOURNAL for Oct. 8, pp. 687, 699; but it will be interesting to give the patentee's own description of his arrangement, in the words of his specification.

The essential feature of the invention consists in the employment of ropes (preferably of wire chains or the like) applied to keep the holder in the working position with the requisite stability, and serving also when required to regulate and adjust the pressure exerted by the holder upon the gas within. The arrangement may consist of upper check-ropes, secured at their upper ends to the top curb of the holder, and of lower check-ropes, with their lower ends secured to the lower part of the lift or of one of the lifts, which check-ropes are controlled in working by means of any suitably-constructed mechanism or appliances to serve as a substitute for fixed columns or standards, or if preferred to be used in combination with them. For instance, where a holder provided with the usual guide-framing is telescoped for enlargement, this system can be applied to the additional lifts without removing the guide-framing erected for the original lifts.

In applying ropes (or chains, &c.) for the purpose, it is proposed to connect the ropes (termed check-ropes) to the holder, and so train them over pulleys or guides, and connect them to other appliances, that the rise and fall of the holder automatically draws the check-ropes into position, and to apply such a check to any tendency of the holder to get out of the level, so that any variation from the level position becomes impossible. The points of attachment of the check-ropes to the holder all rise and fall together; the effect being that any external influences tending to raise or depress the holder at some particular part are resisted by check-ropes on the other side of the holder. Thus a tilting force on one side of the holder is met by a lifting force on the other side, or a depressing force on one side, by a restraining force on the other side; so that no movement but a vertical one can take place. In order that the check-ropes may be always at a suitable tension, whatever be the position of the holder or any of its lifts, it is necessary that the check-ropes should be capable of extending their length in the vertical direction to an extent equal to at least the full travel of the holder; the upper check-ropes being drawn out from some position below the lowest level ever reached by the parts to which they are connected, and the lower check-ropes being similarly drawn out from some position above the highest level ever reached by the parts at which they are secured to the bottom lift, or brought round the pulleys pivotally attached thereto. Pulleys provided at these positions can be employed to divert the check-ropes from the vertical direction, to be connected to and controlled by any suitable mechanism or appliances by which they are given out or taken

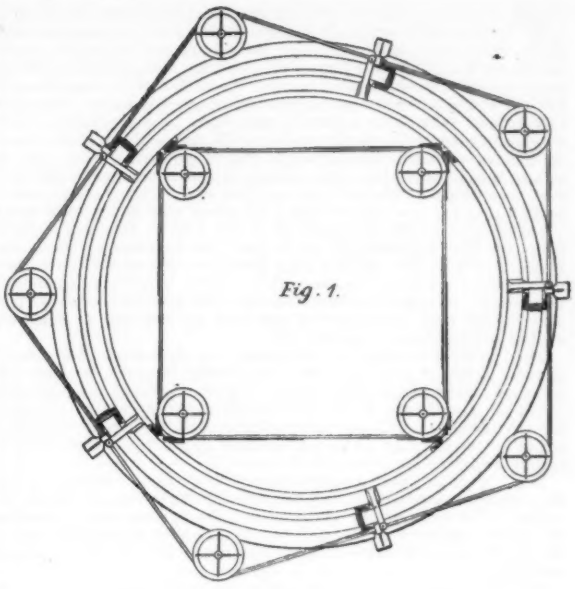
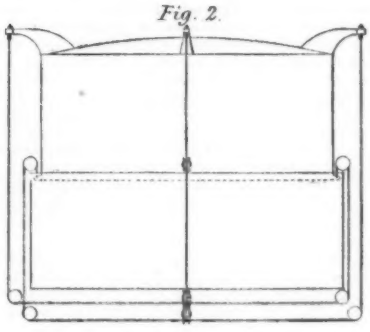


Fig. 1.

Fig. 2.



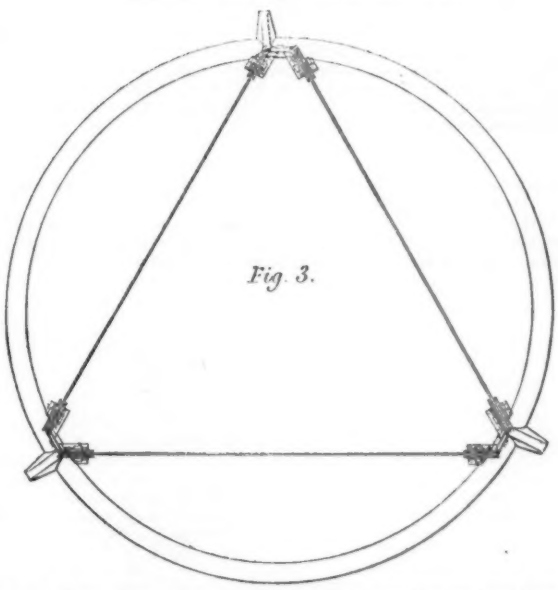


Fig. 3.

up as their upwardly and downwardly extending portions are lengthened or shortened with the rise or fall of the holder. It is preferred that the check-ropes so employed be applied in equal numbers as upper and lower check-ropes; and the combination or arrangement of mechanical parts or appliances by which they are kept in tension and otherwise controlled and brought into action, will generally be simplified by arranging the check-ropes in pairs or couples—an upper and lower check-rope together forming a pair or couple. These pairs or couples are then preferably connected to the gasholder at points equi-distant from each other; the number of such pairs or couples required to prevent the holder from getting out of the level position being obviously not less than three, but they may be any greater number desired.

Although the above-described mode of carrying out the invention, in which separate sets of check-ropes are employed as the upper and lower check-ropes, is generally applicable for both single or multiple lift holders, yet the mode of applying the invention may be modified especially for single-lift holders in the following manner:—The same check-rope which serves as the upper check-rope on one side of the holder, may be brought across the tank bottom and otherwise adjusted by

means of pulleys, so as to serve as the lower check-rope at the other side. In this way, as the check-rope (which may be termed a compound check-rope) is drawn up on one side of the holder, it is correspondingly given out on the other side. Three such compound check-ropes, provided at equi-distant parts of the holder, will generally serve to prevent the lift from getting out of the level position. A further modification (also more especially applicable to a single-lift holder) consists in carrying the check-ropes over the top or dome of the holder on pulleys provided thereon; each check-rope—which may also be termed a compound check-rope—being secured at one end to the tank side or other part sufficiently low to clear the pulleys at their lowest positions, and in like manner at the other end, after being taken round a pulley fixed to the bottom curb of the holder; the parts secured directly to the tank side serving as the upper check-ropes, whilst the parts secured in like manner after being brought round the bottom curb pulleys, serve as the lower check-ropes. Three such compound check-ropes, arranged triangular fashion, will generally serve to prevent the lift from getting out of the level position, and to otherwise control and regulate its rise and fall.

The present specification is accompanied by eight sheets of drawings; showing different ways in which the patentee proposes to attain the object of his invention, when applied to both single-lift and telescopic holders. A reference to the illustration published in the JOURNAL, already referred to, will give a general idea of the manner in which this object is carried out; while the sketches appearing to-day relate to certain modifications of the original plan.

Fig. 1 [p. 1113] shows how an independent system of check-ropes, and their operating mechanism, may be applied to the top lift of a telescopic holder. The arrangement of parts, and the appliances for operating the check-ropes for the outer and intermediate lifts, is precisely similar in principle and also in the mode of working to that already described in detail.

Fig. 2 illustrates another modification of the invention as applied to a single-lift holder, in which the coupling rope (or bar) previously referred to is dispensed with. In this example the compound check-rope is secured at one end to the lower part of the lift, and at the other end to the upper part of the lift on the opposite side, by being brought across the under-side of the holder by means of pulleys. Similarly other compound check-ropes are brought across from the lower part on one side to the upper part on the other side of the lift; the length of rope and the position of the pulleys being adjusted to apply the requisite strain for controlling the lift. As the lift rises, the portion which serves as the upper check-rope is drawn up, whilst the portion which serves as the lower check-rope is given out; and when the lift falls again, the reverse operation takes place. Such compound check-ropes applied to the lift at three equi-distant parts will generally serve to prevent the holder from getting out of the level position.

A still further modification—also specially applicable to single-lift holders—is shown in fig. 3. The check-ropes in this case are arranged in triangular fashion, and carried by means of pulleys over the crown or dome of the lift, and secured to holdfasts at the tank side. The portion which serves as the upper check-rope passes direct over its pulleys to one holdfast; whilst the portion at the other end of the check-rope passes down under a pulley pivotally attached to the lower part of the lift, and up again to a second holdfast at another part of the tank side. In this way, as the holder rises, a portion of the check-rope is drawn out, whilst another portion is taken up. Three such compound check-ropes, arranged as illustrated, will generally serve to prevent the lift from getting out of the level position.

INCANDESCENT GAS-BURNERS.—Harris, C. B., of New York. No. 14,091; Sept. 6, 1889. [6d.]

This invention relates to that class of burners in which an incandescing element is suspended above (or in) a hydrogen or water-gas flame; the various arrangements being shown in the illustration.

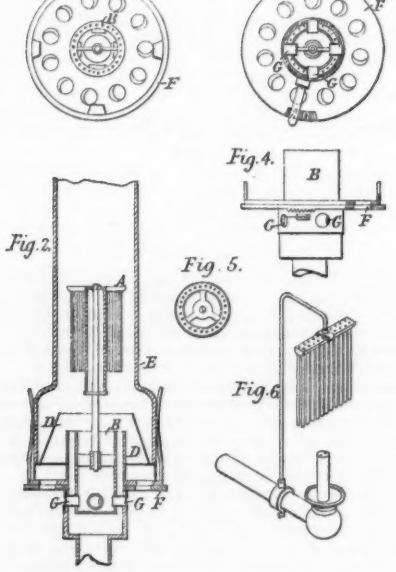


Fig. 1 is a top view of the burner, with the chimney and cone-shaped deflector removed. Fig. 2 is a vertical central section. Fig. 3 is a bottom plan view. Fig. 4 is a side elevation, with the chimney and cone-shaped deflector removed. Fig. 5 is a detail plan view of the filaments or incandescing elements and their holder. Fig. 6 is a perspective view, illustrating a group of tubular pencils arranged above an ordinary fish-tail burner.

The incandescing elements or pencils are made tubular; the opening through the core preferably extending entirely through them, from one end to the other. They are composed of a mixture of magnesia and starch, or magnesia and glue, and made in the same manner as ordinary small macaroni; and after being burnt, they are ready for use. They may be carried in a trough-shaped head A; the pencils projecting through apertures in the trough, and being held in place by a packing of cement A^1 (preferably of the same compound as the pencils) applied while in a plastic condition. In fig. 6 such a head mounted upon a suitable support is shown suspended above an ordinary fishtail burner. In the other illustrations a different type of burner B is depicted. It is circular; and from the interior of the cylindrical burner, an upright or post extends. Upon this post may be mounted the central light and heat reflecting-core, which, in this instance is an elongated cylinder, placed over the post and resting upon a flange thereon. The pencils are suspended above the burner B, and are carried in the same manner as in fig. 6, in a circular head or trough; the trough being supported centrally. The burner B, is provided with the ordinary horizontal annular flange, upon which is mounted the cone-shaped deflector D, and spring arms that hold the lamp chimney E. This horizontal flange is provided with a series of apertures; and a circular, moveable plate F, having corresponding apertures, is arranged beneath the flange. By turning the plate, the amount of air admitted to the exterior of the flame is regulated. Below the plate F, a series of short horizontal tubes G extend from the outer wall of the burner to the interior of the inner cylinder; and around the outer wall is arranged a moveable collar or band having apertures corresponding with the tubes G. By moving this band, therefore, the amount of air supplied to the interior of the burner may be regulated. The band is provided with a projecting spring arm, by which it may be turned; and this arm has upon its upper face a tooth that engages in notches in the under face of the moveable ring F. When the ring or band is turned so that the tooth does not engage the notches, either may be adjusted separately. By bringing the tooth into engagement with one of the notches, the movement of the arms actuates both the band and the ring; and, as the parts are adjusted, the supply of air may be simultaneously increased at the centre and decreased at the exterior, or *vice versâ*, or both supplies may be increased or decreased together.

APPLICATIONS FOR LETTERS PATENT.

18,461.—LEECH, A., "Improvements in and connected with gas-burners." Nov. 19.

18,522.—FAIJA, H., "Improvements in apparatus for controlling the supply of water or other liquid." Nov. 19.

18,530.—COWAN, W., "Improvements in prepayment gas-meters." Nov. 20.

18,563.—CLAMP, C. J., "A gas economizing and regulating machine." Nov. 20.

18,599.—BOULT, A. J., "Improved process and apparatus for the production of best hard charcoal, together with the simultaneous recovery of acetic acid, wood spirit, tar, ammonia, and gas." A communication from Zwillinger, Nov. 20.

18,631.—HUMPHRIES, H., "Improvements in connection with gaseliers and the like for carrying away the smoke and noxious gases, and for preventing the ceiling being discoloured thereby." Nov. 21.

18,641.—VALON, W. A. M'L., "Improvements in prepayment wet gas-meters." Nov. 21.

18,673.—STEVENSON, J., "Improvements in or relating to gasholders." Nov. 21.

18,694.—SHAW, J. F., and SHAW, R. H., "Improvements in gas and other explosive engines." Nov. 22.

18,796.—WANNER, S., and REDMANN, J., "Improvements in gas-burners." Nov. 23.

18,801.—SIMMANCE, J. F., "Improvements in ventilating apparatus, more especially in connection with gas lighting." Nov. 23.

18,823.—ZWILLINGER, L., "Improved process and apparatus for the production of best hard charcoal, together with the simultaneous recovery of acetic acid, wood spirit, tar, ammonia, and gas." Nov. 23.

18,828.—JAMES, C. J., "Improvements in gas-burners or attachments thereto or therefor." Nov. 23.

18,831.—KIRKHAM, HULETT, and CHANDLER, LTD., and CHANDLER, J., "Improvements in apparatus for separating or extracting tar and other impurities from gas." Nov. 23.

18,855.—WHITE, F. W., "An automatic attachment for gas and other taps or cocks, valves, &c." Nov. 25.

18,970.—WOODWARD, J., "Improvements in apparatus, mechanism, and arrangements for the manufacture of gas from coal, cannel, or other suitable material." Nov. 26.

19,019.—BARKER, F. W., "An improved gas-regulator." A communication from W. C. Rossney. Nov. 26.

19,048.—ROWSON, F. G. and J., "Improvements in lighting appliances." Nov. 27.

19,121.—ROBINSON, W. G., "Improvements in apparatus for generating and burning gas from heavy oils or carbonaceous fluids." Nov. 28.

19,128.—BONNE, C. R., "Improvements in meters for liquids." A communication from H. Meinecke, jun. Nov. 28.

19,183.—YEADON, J. A., and ADGIE, W., "Improvements in retorts or furnaces for the distillation of coal or other analogous purposes." Nov. 29.

19,225.—WILTON, T. and G., "Improvements in or connected with the manufacture of sulphate of ammonia and apparatus therefor." Nov. 29.

19,256.—TREWBY, G. C., "Improvements in the method of and means for charging gas-retorts." Nov. 30.

19,267.—FISHER, R. B., "Improvements in or relating to gas taps or cocks in connection with gas-burners." Nov. 30.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

THE SOUTH METROPOLITAN GAS COMPANY AND THEIR LABOUR TROUBLES.

SIR,—In any case, a large number of engineers and managers will be in sympathy with the action taken by the South Metropolitan Gas Company with regard to the gas stokers' strike. I do not, however, think they will be in accord with them in the action they have taken in advertising in the local papers throughout the kingdom for able-bodied men, and holding out strong inducements, by giving a large bonus for the first week and succeeding weeks during the continuance of the strike. This must tend to demoralize stokers in every gas-works in the land, make them dissatisfied with their present employment, post up the uninitiated in the great strait the Company is reduced to in resisting a determined strike, and will have but one effect on the persons appealed to—viz., "Go thou and do likewise." It also conveys the impression (perhaps an erroneous one) to all gas managers, that they may sink so long as the South Metropolitan Company swim.

An appeal for help to gas managers individually, asking if they would search out able-bodied labourers, or if they could spare such from their own works, could not have been complained of; but an open advertisement of the kind referred to, circulated in every town in the kingdom (copy of which I enclose), must be objectionable from every point of view.

Ramsgate, Dec. 7, 1889. WILLIAM A. VALON.

IS WATER GAS POSSIBLE FOR BRITISH GAS-WORKS?

SIR,—Your correspondent Mr. Van Steenbergh appears to have made my last letter on this subject a pretext for sounding his own trumpet; and perhaps this is excusable, as he seems to be one of those unfortunate individuals who has received but scant honour in his own country—at least so far as his water gas generators are concerned; for he informs your readers that there are 305 cities in America where water gas is used, but omits to mention that, out of a total of 367 water gas plants, only eight are the "Van Steenbergh" water gas generators. Now, seeing Mr. Van Steenbergh claims to produce 1000 cubic feet of 22-candle gas from 25 lbs. of anthracite coal and only 2½ gallons of naphtha, instead of the generally admitted quantities of 40 to 50 lbs. of coal and 4 to 5 gallons of oil, it strikes the ordinary mind as being strange that these generators are not more widely used. Further, on reference to an American Directory of Gas Companies, I find the average price of gas sold in five of the towns where Mr. Van Steenbergh's plants are used, works out considerably over 7*s.* per 1000 cubic feet. This is interesting, when taken along with the claim of 25 lbs. of coal, and 5½ gallons of oil for 1000 cubic feet of 22-candle gas.

I am not surprised at Mr. Van Steenbergh's claims after the experience we have had of water gas patentees; for one company actually assert they can make water gas for less than nothing, whatever this may be, which beats even Mr. Van Steenbergh. When he speaks of London gas, I am at a loss to know why *nominal* 16-candle is used, and *average* 22-candle water gas. According to a large number of photometrical tests made by independent authorities, the illuminating power is proved to be nearer 17 than 16 candles, and probably if Mr. Van Steenbergh's reputed 22-candle gas was subjected to the same scrutiny, it would tell a different tale.

Now, according to Mr. Van Steenbergh, unless English gas companies commence to supply 22-candle water gas, they will soon become extinct, and no doubt your readers will give due heed to this warning, especially seeing it comes from such a disinterested party (?).

I prefer to base my arguments on facts, and not on the fine-spun fancies of an excited imagination; as instanced by the roseate picture Mr. Van Steenbergh draws that if gas companies will only supply this almost inodorous but poisonous water gas, perfection will be achieved, and gas consumers will be for ever happy. Well, your correspondent, who appears to be flowing over with righteous indignation at one who has not been to "my country" venturing to express an opinion on water gas, will not deny that in American cities where this much be-praised gas is supplied, there the electric light flourishes, and the gas consumption per head of population does not amount to one-half the quantity used in England, where impure, smoky (*sic*) coal gas is supplied. It would be a pity to damp the sanguine anticipations of Mr. Van Steenbergh; but I warn him that cost is an important factor, and the British public will not take carburetted water gas just at the value of interested partisans.

I hope to have the pleasure of accepting Mr. Van Steenbergh's invitation to inspect his water-gas plant at Humphreys' Hall; for I am at present unable to understand how an ordinary small generator, with fixing-chamber above, can give such high results. J. FERGUSON BELL.

Stafford, Dec. 7, 1889.

THE DINSMORE PROCESS OF GAS MAKING.

SIR,—The paper read on the above process at Manchester leaves the remarks made in my letters to the JOURNAL of March 12 and 26 last "severely alone." It is therefore, I think, undesirable for me to enter into any very minute criticism of statements which the author of the paper believes are borne out in practice, but which to me cannot be reconciled with what have hitherto been considered reliable data. I desire, however, to point out, for further consideration, some of the figures in the paper read that do not appear to agree either with each other or anything hitherto accepted as correct.

The author says that, by mixing two-thirds of gas made by the ordinary process with one-third of gas made by the Dinsmore process, he obtains 9600 cubic feet of 19-candle gas. This is arrived at by the two-thirds yielding 9300 cubic feet per ton of 16·5-candle gas, and one-third yielding 10,300 cubic feet per ton of 20·5-candle gas. This may be disproved by working it out in pounds of sperm as follows:—

2 tons ordinary process, 9,300 c. ft. per ton, 16·5-candle gas =	1052·22 lbs.
1 ton Dinsmore process, 10,300 „ „ 20·5-candle gas =	723·942 „
	1776·162 lbs.

Therefore, 1776·162 lbs. divided by three, equals 592·054 lbs. = 17·92 candles on a make of 9633 cubic feet. It therefore follows that, to produce an average illuminating power of 19 candles on the whole make, the one-third Dinsmore gas must have an illuminating power equal to 23·5 candles.

To secure an average yield of 9600 cubic feet of 19-candle gas by distilling two tons of coal by the ordinary process, and one ton by the Dinsmore process, the one-third by the latter system must, as already said, produce 10,300 cubic feet of 23·5-candle gas, and therefore yield from the distillation of the tar 1000 cubic feet of 88·74-candle gas. The difference in weight between 9300 cubic feet of 16·5-candle gas and 10,300 cubic feet of 23·5-candle gas is 111·767 lbs.

The author does not give the weight of coke drawn from the duct; but as this must be at least one-third of the original weight of the tar, it follows that this weight must be at least 168 lbs. Where does it come from?

Table given by Author of Specific Gravity of Dinsmore Gas.		Table given by Author of Specific Gravity of Town Supply.		Table of Specific Gravity generally accepted.	
Candle Power.	Specific Gravity.	Candle Power.	Specific Gravity.	Candle Power.	Specific Gravity.
21·27	·419	18·60	·420	13·00	·416
22·40	·436	19·40	·438	22·00	·537

These show great variation with each other and accepted data.

I notice the author further says it is not expedient to apply the process to the whole of the retorts in action, as the *increased production of gas per ton would diminish the quantity of coals carbonized and the residuals in proportion.* Now, this to me would seem to be the thing most desirable in any improved system of carbonization. The author, however, has, I think, arrived at an illogical conclusion; for if the object be the increase of residuals, then the Dinsmore process stands in the way, and does not assist to this end, as he will obtain more bye-products and tar of a better quality by abandoning it.

Ramsgate, Dec. 6, 1889. WILLIAM A. VALON.

PHOTOMETRY.

SIR,—I have read Mr. Methven's paper on "Photometry" with much interest; but there is one point which he does not mention, and which is a source of considerable trouble to me—that is, the great variations in the *rate of consumption* of sperm of the "standard" candles.

In the summer months, they burn the normal 20 grains each candle in the 10 minutes or thereabouts; at any rate, considerably within the limits prescribed by the Gas Referees. But in the winter months, all is uncertainty. In a large percentage of the tests made during this part of the year, the candles burn too slowly; and consequently these tests have to be rejected. As prescribed, 9·5 minutes and 10·5 minutes are the limits between which 20 grains of each candle are to be consumed; but I have used pair after pair of candles which took 11·0, 11·25, 11·5, 10·9 minutes to consume the 40 grains. On one occasion lately I tested a pair which took 12·93 minutes to consume 40 grains. This is at the rate of 185·6 grains per hour, instead of 240 grains as they should, and burning with a small flame. This test was made in a room with the temperature at 70° Fahr. On the following day I tested them again at a temperature of 61° Fahr. and they took 12·22 minutes, or at the rate of 196·4 grains per hour. This pair was certainly unusually slow-burning; but all these results I think show the inadvisability of having for a "standard" such a very unreliable source of light.

There is no doubt that aqueous vapour has a great deal to do with these different rates of consumption. Amongst many experiments I have made connected with this subject, I once made the atmosphere of the photometer-room very moist with steam; the result being that the candles burnt with a very small flame, and took considerably longer to burn a given quantity of sperm. Rise or fall of temperature does not appear to have any appreciable effect on the candle itself; for I have exposed some to cold and heat, but the rate of consumption is practically unaffected thereby. I keep the photometer-room at a constant temperature both summer and winter.

If some of your readers would kindly give us their experience in this matter, I am sure it would be received with much interest.

Dec. 6, 1889. PHOTOMETER.

INCLINED RETORTS.

SIR,—What, in the estimation of the British Patent Office, constitutes an invention? I am induced to ask this question as I have before me a number of the JOURNAL for Nov. 26; and I am wonderingly contemplating the drawing and description of Mr. Kitt's excellent counterpart of M. Coze's system of inclined retorts.

I was aware that several English engineers (as would naturally be expected) had already applied for letters patent for inclined retort-settings, after inspecting M. Coze's arrangement; but it was also naturally expected that these would contain a minimum originality that would enable the patentees (not *inventors*) to *legally* deprive M. Coze of any benefits that might accrue to him for his exertions. But that we should so soon be confronted with an exact copy of M. Coze's arrangement, and that this has obtained the sanction of the Patent Office, baffles comprehension.

The writer has recently been in Rheims, and is acquainted with all the details of the Coze arrangement; and one might fairly ask Mr. Kitt to point out in what particulars patent No. 14,881 differs from M. Coze's. I can only assume that the patentee is ignorant of the French system; and by one of those happy and unaccountable inspirations, has hit upon exactly the same ideas even to minute details.

It is not within the purport of this letter to discuss the entire originality of M. Coze's plan. But I am prepared to maintain that M. Coze has solved points that vitally affect any system of inclined retort-settings; and he is entitled to consideration and protection for the time and money he has spent in solving these points.

The proper angle of the retorts, the angulated mouthpieces, the constricted form of retort (conspicuous by its absence in Mr. Kitt's plan),

the pivoted scoops, the form of scoop-carriage—all these are the outcome of years of patient thought and labour; and it seems hard that even details should be coolly appropriated by so-called *inventors*, to the detriment and the exclusion of the man who is really entitled to the credit.

Imitation is the sincerest form of flattery, we are told; but I apprehend that, however gratified M. Coze may feel by the delicate attentions patentees will make to "flatter" him, yet he would prefer a more substantial and worthy recognition of the pains he has taken to perfect a system which, from the very fact of its being so speedily imitated, must be considered a success.

"PUT YOURSELF IN HIS PLACE."

Dec. 3, 1889.

SIR,—I am glad to see that our engineers are trying to believe in the advantages likely to accrue from setting retorts at a given angle, instead of horizontally as in the past; but I must at the same time remark that I have been wondering for some four or five years why their believing has been so slow. Had it not been for the letter from Mr. W. Key, of Glasgow, following your notice of M. Coze's experiments and success with inclined retorts, in the JOURNAL for Aug. 11, 1885, I should have put it down that all your readers had made up their minds that the Editor had written something while he himself lay dreaming. But it is no dream now. If it is worth anything at all, it will soon be known for whom.

W. MANN.

Nov. 30, 1889.

INCREASE OF WAGES AT THE SHEPPY GAS-WORKS.—The Directors of the Sheppy Gas Company, upon the recommendation of their Engineer (Mr. W. T. Carpenter), have raised the wages of the men employed at their works. The increase was unsolicited on the part of the men.

BIRMINGHAM ELECTRIC SUPPLY COMPANY, LIMITED.—A Company under this title was registered last week to purchase a transfer of the Birmingham Electric Lighting Order, 1889, and of the rights and powers conferred thereby, and to exercise and carry them out; also to generate, produce, sell, and supply electricity for all purposes.

THE ELECTRIC LIGHTING DEADLOCK AT NEWCASTLE.—The recommendation of the Newcastle Town Improvement Committee, to which we referred in our last week's issue (p. 1067), that the Corporation should be asked to seal agreements with the Newcastle-upon-Tyne Electric Supply Company and the Newcastle and District Electric Lighting Company, permitting them to proceed with their works pending the granting of Licences by the Board of Trade, came before the Council last Wednesday. Mr. Winter having stated that the agreements would give the Corporation complete control over all matters in connection with the streets, the recommendation was agreed to.

MOUNTAIN ASH LOCAL BOARD WATER-WORKS.—The tender of Messrs. Batchelor and Snowden, of Cardiff, for the construction of additional works of water supply, has been accepted by the Mountain Ash Local Board. This contract includes the construction of a storeage reservoir, to be situated near the Clydach, about two miles from Ynysybwl; also the carrying out of the work in connection with a service reservoir to be made near Old Ynysybwl. The same firm have recently completed the laying of about 12 miles of water-mains in connection with these reservoirs. The cost of the works will exceed £16,000; and these have been designed by Mr. James Mansergh, M. Inst. C.E.

ISSUE OF ADDITIONAL STOCK BY THE BELFAST WATER COMMISSIONERS.—Last Thursday, the Belfast Water Commissioners resolved, under the authority of their Act of last session, to create and issue redeemable stock to an amount not exceeding £300,000—(1) for raising £33,165 on account of the money which they have authority to raise by borrowing; (2) for raising, instead of reborrowing, £243,295 required for the purpose of paying off various sums which will fall due before Nov. 1 next year, being a portion of their debts now subsisting on the security of outstanding securities granted by them for raising money for the purposes of their Acts, and which sums they are authorized to reborrow; (3) for raising £23,539 for paying off all redeeming statutory securities granted by the Commissioners under their Acts, and now outstanding.

THE NORTHERN COAL TRADE.—The coal trade of the North shows rather different states just now. The Northumbrian steam coal trade is duller, and there is a falling off in the demand which is usual at this time of the year. The best steam coals are quoted at 11s. per ton, free on board in the Tyne. Second qualities are scarcely so strong; and some of the pits have now and again an idle day. Best small steam coals sell at 6s. per ton, also free on board. Gas coals are now in far above average request, and probably exceeding the requirements of any previous winter. This is true, at any rate, as to some of the local gas companies. More gas coal is also being sent to the large companies of the South, partly because of the increased use, and partly to make up for deficiencies in the supply through the past strikes. Most of the coal sent out is on old contracts at low prices, and it does not yield the profit to the coal-owner that it should. But it is a proof of the fulness of the demand for gas coal; and it is an indication of the local activity in trade. Prices of gas coal for prompt supply have risen again, and sales have been made at 12s. 6d., free on board in the Tyne, or double what some contracted coal is being sold at similarly delivered. The miners are now working better, and supplies should be good till the end of the year. Coke is very firm; gas coke being sold at 13s. per ton at the works.

THE PRICE AND QUALITY OF GAS AT DARLINGTON.—The Darlington Town Council, at their meeting last Thursday, agreed, on the advice of the Gas Committee, to raise the price of gas to all consumers 2d. per 1000 cubic feet. Mr. Barron, in moving approval of the Committee's proceedings, explained that the coal contracts had been let for next year at something like 43 per cent. in excess of existing prices. This, of course, entailed upon the Committee the necessity of providing for the increased expenditure; and the only way they could see to do this was to put up the price of gas. They did not recommend so large an increase in price as some members thought was needed, but hoped to be able to tide over the difficulty with an extra 2d. per 1000 feet. If this advance was not found sufficient—if the estimates were in any way exceeded—the Committee would have to call upon consumers for a still further increase. Mr. Drury said he was not surprised at the recommendation of the Committee; but he did hope they would consider the question of supplying a purer gas and of better illuminating power. He had no hesitation in saying that the gas for the past month or so had been very bad. Mr. Barron observed that the Committee had been placed in an awkward position. The collieries did not deliver the coal according to contract, owing to pressure from their workmen; and consequently the gas was not so good as the Committee desired to supply to the consumers. The matter, however, would receive serious consideration. The minutes were confirmed.

Miscellaneous News.

THE MYSTERIOUS DEATHS OF WORKMEN AT THE LEEDS FORGE.

The inquiry into the circumstances attending the deaths of the two men, Henry Tennick and Richmond French, which recently occurred at the works of the Leeds Forge Company, as reported in the JOURNAL last week (p. 1068), was resumed at the Town Hall last Tuesday, before Mr. J. C. MALCOLM, the Borough Coroner.

Mr. W. WARREN again appeared for the Leeds Forge Company (Mr. Samson Fox, the Managing Director, being present); Mr. T. GREENWOOD TEALE, for the British Water Gas Syndicate; Mr. H. A. CHILD represented the relatives of the deceased men; and Mr. C. MELLOR watched the proceedings on behalf of the proprietors of "Warner's Safe Cure," which, it had been stated, the men were in the habit of taking. Mr. RICKARDS, Inspector of Factories, was also present.

Mr. G. Taylor, Chief Inspector of the corrugated flue department at the works, was the first witness. He stated that Tennick was a subcontractor, with 63 men in his employ. Witness had often seen him in the morning showing signs of having taken intoxicants on the previous evening. Nobody but Tennick and French had any right to use the cabin in which they were found, where they kept tools and drawings, and paid the wages of their men. They had a key of the cabin, which they took away every evening. On the morning of the fatal occurrence he went with French to the office at half-past eleven. He had seen him go there several times that morning from nine o'clock, and he never complained of any escape of gas or heat in the cabin. At half-past eleven, when witness went in, he found Tennick asleep on the seat, with his head to the door and his feet to the stove. French shook Tennick. Witness explained some plans to French; and Tennick, rousing himself, also looked at them. Witness never afterwards saw the men alive. Between 2.30 and 2.45 p.m. he went to the cabin to see Tennick about some work. He lifted the latch, and saw Tennick's body lying at full length on the seat, in the same position as previously. French was sitting on a piece of wood, with his head on Tennick's chest. He at first thought they were asleep, though he had never seen French asleep there before. Witness then went away. Both the deceased should have been supervising their work at the time. A man named Rowbottom afterwards came and told him that Tennick was dead; and on going to the cabin he found a crowd, and the bodies being brought out. A doctor and policeman were sent for. The cabin door was locked; but the key was afterwards found in the possession of a workman. Witness then opened the door, and looked in. The lights over the table were burning at the full. The tap over the stove was slightly turned on; and he shut it off in a few minutes. The room was of a comfortable heat. He then came out and locked the door. Shortly afterwards Mr. Hargreaves (the surgeon) and the police inspector arrived.

Cross-examined by Mr. CHILD, witness said he turned off the stove tap as he thought it would be of no further use; but he left the gas-jet alight, as there might be people going in. On seeing the deceased men in the cabin at half-past two, he left them to find the Manager. The deceased were contractors, who worked by the piece; but they were under the direction of the Manager. He did not try to awaken them, thinking they were only asleep; he certainly did not suppose they were dying. There was nothing unusual in the sleeping; only it struck him that the positions were peculiar. He had seen drink in the cabin—had himself had it with the deceased; but he did not know that the drinking habits of the deceased had ever interfered with their working capabilities.

Mr. A. Scattergood said he was a Licentiate of the Royal College of Physicians and Surgeons, Edinburgh, and had been in practice for seven years. He had attended and performed a great many *post-mortem* examinations; but prior to the examination in this case had never been affected in his health by them. He attended the *post-mortem* in this instance on the first day it was held, and became unwell and unconscious. The general symptoms he experienced were rather a difficulty in breathing, a tightness across the chest, and a feeling of faintness—sickness and weakness. His knees began to shake; his head felt full; and a cold perspiration came upon his forehead. He remembered nothing more until he was regaining consciousness. He did not know whether he had a recurrence of the symptoms; but he felt sickly and vomitted during the rest of the afternoon and evening. He had intense pain across the forehead until three or four o'clock the next morning. At the time of the first seizure, he had his sleeves turned up and the scalpel in his hand ready to make the first incision. Before leaving home in the morning he was in perfectly good health. He had never before had any fits or faintings. He believed the symptoms he had described were quite consistent with poisoning from carbonic oxide.

The CORONER here mentioned that he had had a letter from from Dr. Stevenson, stating that Professor Pepper, who was professionally representing the Water Gas Syndicate in the matter, had asked for portions of the blood of the deceased for analysis. Immediately he received the letter he telegraphed back instructing Dr. Stevenson to hand over portions, and to assist Professor Pepper as much as possible.

Joseph Greaves deposed to having seen the deceased men take "Warner's Safe Cure"—taking a mouthful from the bottle without measuring. Both men had been taking it for some weeks. Tennick was in the habit of drinking; but witness had never seen him incapable of doing his work in consequence.

Sugden, another workman, said that after the bodies had been removed from the cabin he locked the door. He noticed that the stove tap was turned on; but he could not say whether the stove was alight or not. He noticed, however, that the iron top of the stove was not quite cold. After the occurrence, one of the Managers (Mr. Campbell) told him that the door of the cabin was to be locked, and nothing touched; but the witness Taylor went in, and turned off the stove before he could see him.

Thomas Wright, another workman, said the deceased man French worked by the side of him all the morning on the day of the fatal occurrence till midday. Just before twelve o'clock French came out of the cabin with a pint pot in his hand, and told him to get some water, as Tennick had been taken ill. He fetched some, and French bathed Tennick's forehead. Tennick seemed to be asleep; but he was not making any noise. Witness never saw him again until he was carried out dead. He knew nothing about Tennick's drinking habits.

Mr. WARREN: Did you not say yesterday that Tennick had been a heavy drinker for some time?

Mr. CHILD asked if Mr. Warren was entitled to put this question.

The CORONER said he thought not.

William Rowbottom deposed that he had been spoken to about the water gas light going out once in the works without any assignable cause.

Joseph William French, son of the deceased, Richmond French, said he took his father's dinner into the cabin at half-past twelve on the day in question; his father shook his head as if to mean that he was to go out. He saw all the morning, by the light through the window, that the

gas-jets were alight. He had known the stove to "jump out" without being turned out. This was a month or five weeks ago.

Mr. WARREN: When did you tell anybody about that?

Witness said he mentioned it first that morning to his uncle, George French, as they were on their way to the inquest. He was in the cabin one breakfast-time when this occurred. David Megson, who was still employed at the Forge, was present. Witness mentioned the matter to others in the shop. His uncle (the witness Greaves) was also present when the stove went out. The light from the gas-jet did not go out, although it was supplied from the same pipe as the stove.

Greaves, recalled, said he was in the cabin on one occasion when the previous witness said: "This stove has gone out." He, however, took no further notice of the remark.

French, recalled, said that when the stove "jumped out," there was an escape; but by whom the gas was turned off he did not know. His brother, John French, spoke about the occurrence on Monday. At the time he referred to, he did not know that the gas was dangerous.

David Megson, the man referred to by the previous witness, having been sent for, stated that he had twice had breakfast in the cabin. On the second occasion he put his can upon the stove to be warmed, and had to take it off again because the gas went out. The stove was afterwards re-lighted immediately. Before lighting it all present looked at the tap, which was on at the full. They obtained the light for the purpose by means of paper applied to the jets of light over the desk, which had not gone out.

The CORONER: Did you look upon it as an unusual thing at the time?

Witness: No; I took no further notice of it.

When did you next have any conversation about it?—Not until to-day.

Mr. *W. L. Wildy*, Engineer to the Leeds Forge and Manager to the water-gas plant, said he had at the forge an office which was supplied with water gas from the same main as that from which the cabin referred to was served. He had never known the gas to go out; indeed, it had not been turned out in his office for six months together. He never heard of a water-gas jet going out on the works. The flame did not even flicker; it was a steady flame. He did not see how the stove in the cabin could go out. About 300 towns in America were lighted with water gas; while in a great many more places it was used for metallurgical purposes. There were also plants at Essen and in Austria. He was an expert in water gas, and believed he understood it thoroughly. The plant at the Leeds Forge was erected under his supervision, and the machinery was in perfect working order. The gas used for welding purposes was very pungent of sulphuretted hydrogen. The gas for lighting purposes was odorized by means of mercaptan and pyridine, which gave to the pipes wherever the gas travelled a garlicky, sulphurous smell.

By Mr. CHILD: He had control of the water gas only up to the 1st of November. After that date he became Engineer of the Water Gas Syndicate; but had gone to the Leeds Forge, as he liked to keep himself *au courant* with what took place there. He was there on the Sunday before the accident, and again on the Thursday afterwards. The lighting gas was purified, and the welding gas only filtered and not odorized artificially. Tests of smell were continuously made to ascertain whether the gas was sufficiently odorated.

Mr. CHILD (quoting from a document): "Much has been said and written about the danger of using water gas, as it contains a higher percentage of carbonic oxide than ordinary coal gas. That it contains this percentage is perfectly true; and that carbonic oxide inhaled by warm-blooded animals is poisonous is an acknowledged fact." Under these circumstances, did you warn the persons having to do with it?

Witness: I told them to be careful with the gas wherever it was laid on.

Did you not warn them of danger to life?—I expected that what has been written and said by myself, and the general information given, would have warned them.

"Coupled with its poisonous nature is also the fact that the gas is, when purified, without smell, and therefore an escape occurring in any room or office without being perceived would have the effect of stupefying the inmates. To meet this objection to the use of water gas, a special device has been invented by the British Water Gas Syndicate by which a powerful and disagreeable odour is imparted to the gas, which immediately proclaims its presence should an escape occur." What is that device?—It was a machine for injecting mercaptan into the gas.

Cross-examination continued: As to water gas being dangerous, he knew that the proportion of cases of suffocation in America by water gas and by coal gas were exactly similar. He did not know that water gas was tried at Messrs. Lister's mills at Addingham a few years ago, and that the plant had to be taken out in consequence of the girls fainting from the effects of the gas.

By Mr. WARREN: There was carbonic oxide in coal gas, and coal gas suffocated just as much as water gas. Carefully used, odorized water gas was no more dangerous than coal gas. They were using 100,000 feet of carbonic oxide every day in their works. It was employed in many works in the country, and there was no danger if it was properly used.

By the CORONER: If 1 per cent. of water gas were injected into a living room, he should not apprehend any danger.

By Mr. CHILD: He thought it quite possible for the gas-stove light to have gone out with a can being placed on the hole at the top, notwithstanding that there was a door in the side of the stove. There would be no draught underneath if the top of the chimney outlet were closed.

By the CORONER: Assuming that the medical men at the *post mortem* examination were affected by water gas, he could not explain, if it were odorized, why they did not smell the gas. Smell was the only test applied in this matter. If anybody had looked into the cabin stove in the dark, he could not have failed to see the light if the gas was being burnt.

By a JURYMAN: Carbonic oxide was highly inflammable. It was of itself of a very heavy nature; but if, as in the case of water gas, it was mixed with hydrogen, it was considerably lighter, and would rise like ordinary gas. The gas-mains were laid in proximity to the cabin.

Mr. WARREN said the mains had been bared at this point, and not the slightest escape was discovered.

By the CORONER: No mains passed through the band-room where the *post-mortem* examination was commenced.

George Elsworthy, a plumber's labourer at the Leeds Forge, said on the day of the examination, just after the doctors had come out of the band-room after beginning, he was sent by Mr. Wildy to examine the taps. Altogether, there were four clusters of eight jets each in the room. One of these clusters he found to be leaking. It was supplied by a separate pipe. When he tried to light the jet, the light was about the size of a pea; but it would not do any harm.

By Mr. CHILD: He could not smell anything. He saw a light in the band-room on the Thursday morning—the day on which the inquest was opened; but he could not say when it was lighted or turned off.

Mr. WARREN undertook to ascertain this fact if possible; and then the inquest was further adjourned until the next day.

On the resumption of the inquiry the following morning,

Mr. *Wildy* was recalled, and, in answer to Mr. CHILD, said he superintended the fixing up of the gas apparatus at the Leeds Forge, but did not know until after the accident that water gas was used in the cabin. He did not know when or where the stove was made; but, as far as he could see, it was an ordinary gas-stove adapted for water gas. He was not consulted about it.

In answer to a JURYMAN, witness explained the alterations which would be necessary to convert an ordinary gas-stove into a stove for burning water gas. He said the air mixture was done away with, but no alteration was needed in the chimney flue. He also described the construction of the stove in the cabin. Witness went on to explain that water gas was a mixture of hydrogen and carbonic oxide, the proportion of hydrogen being about 50 to 51 per cent., and of carbonic oxide from 38 to 40 per cent. The specific gravity of the gas was about ·51 to ·54, or about half the weight of the atmosphere; so that water gas, if allowed to escape, would rise in the air.

Mr. CHILD: Witness has said that water gas is a combination of carbonic oxide and hydrogen. Does he mean a mechanical or a chemical combination?

Witness: It is neither a mechanical nor a chemical combination; it is a mechanical mixture pure and simple. The question is evidently put with the idea of asserting ultimately that, being a mechanical mixture—

Mr. CHILD objected to the witness making such a statement.

Witness: I am referring to remarks made on the first day of the inquest by some of the medical men, who suggested that, the specific gravity of carbonic oxide being so near that of the air, the carbonic oxide in water gas would precipitate. I had never made any experiment before with regard to that. It was a new theory altogether; and therefore I waited until the following Sunday, when our gasholder could stand for a period of 20 hours. I then took a sample of the gas, the analysis of which gave: Carbonic acid, 2·4; oxygen, 0·2; carbonic oxide, 41·4; showing that after 20 hours of perfect quiescence the carbonic oxide had not precipitated in the slightest degree. Therefore the mechanical mixture was maintained, at any rate after 20 hours of rest.

John French, son of the deceased Richmond French, deposed to having seen the tap of the stove in the cabin turned on, and the gas not burning. When he afterwards mentioned to his father that the gas had gone out, the latter said it did not matter; and he thought nothing about it. If it had been ordinary gas, the workmen would have been afraid; but as it was water gas they were not. They did not know that water gas was dangerous in use.

A labourer at the Leeds Forge was called to give evidence with reference to the band-room in which some of the doctors fainted during the *post-mortem* examination. He stated that he was in the room for some time while the gas was alight on the afternoon of the day on which the deceased men died, and neither he nor the women who attended to the bodies experienced any ill effects. Nor was he affected in any way whilst preparing the tables for the *post-mortem* examination on the Friday.

Two other witnesses deposed to having been in the band-room on several occasions without noticing anything peculiar.

Mr. WARREN here stated, in reference to the question put to Mr. Wildy on the previous day, as to the effect of the gas used at the Addingham Mills on the girls employed there, that he had received a telegram from the mills in these words: "We have never used anything but coal gas in our mill."

Mr. *Rickards*, Factory Inspector, remarked that in 1860 water gas was used at the mills; but the plant was taken out in consequence of the frequency with which the girls had to be carried out of the room in which the gas was used.

The inquiry was then further adjourned till the 18th inst., by which date the results of the analyses by Dr. Stevenson and Professor Pepper are expected to be ready.

THE SALFORD GAS SCANDAL.

THE PROPOSED PARLIAMENTARY COMMISSION.

The promoters of the petition to the House of Commons for a Royal Commission of Inquiry into the Salford gas frauds have recently prepared and issued an appeal to their "fellow-ratepayers," urging them to lose no time in signing the petition. The text of the document is as follows:—"That in the interests of this borough, and of the purity of municipal life throughout the United Kingdom, a Parliamentary Commission to inquire into the gas frauds is absolutely necessary has been amply proved by the report of the Consultative Committee, and the subsequent legal proceedings on the matter. The evidence taken before the Gas-Works' Investigation Committee and the additional information acquired by the Consultative Committee and the Town Clerk, are not to be divulged; and you are never to know who bribed Hunter, nor who may have been wrongfully accused of corrupting him. Is that fair? is it honest? According to the Town Clerk, the Consultative Committee have practically delegated the whole of their powers to him. He alone is to decide and without consulting them, whom he shall proceed against, and when he shall cease such proceedings. Moreover, he (the Town Clerk) insists that he has the right to refuse to say against whom he may have caused writs to be issued, and also to advise the Mayor to rule out of order every notice of motion or resolution bearing in any way on the compact with Hunter. Ought such power to have been placed or to remain in the hands of any, let alone a newly-appointed paid official of the Corporation? A coal contractor has asserted that the borough has lost at least £500,000 through the corruption practised in respect of coal and cannel contracts alone. Now, during the period of Hunter's management, he practically gave out contracts for about one million tons of coal and cannel. On one of those contracts it was proved in Court that a secret commission of 1s. 6d. per ton—or (say) £2250 on 30,000 tons of coal—was paid in fraud of the Corporation; and we must remember that Hunter was not the first delinquent in this respect. Such secret commissions and other bribes were not, however, confined to coal and cannel contracts, proceedings having been brought in the High Court of Justice by the Corporation against machine-makers, gas-meter firms, and others. From Hunter's own lips, we know that his corruption by contractors was almost general. Can it be believed that Hunter pocketed the whole of his illicit gains and had no confederacy with whom he had to divide them? If so, why all this seemingly unaccountable and determined opposition to a Royal, or any other Commission? Is it proper or expedient that the Corporation should be reduced to act as mere collecting agents for Hunter, solely to enable him, by means of threats and writs, to extract from contractors a second commission in order to enable him to make up the £10,000 he has agreed to pay the Corporation? Is it right that in return for that paltry sum a release should be given to Hunter and to everyone else who may have been implicated in the frauds on the Corporation? Is Hunter to be permitted to escape all personal restitution of his illegal gains, and possibly to pocket a large sum in addition by means of the actions brought by the Town Clerk? Are scores of guilty contractors and others to be allowed to get off absolutely scot-free, while innocent contractors are to suffer in reputation for the malpractices of their competitors? If you agree that this compact is an unwise, unjust, and an undignified dealing with your interests, pray lose no time in signing the petition."

LEEDS BOROUGH COUNTY COUNCIL GAS SUPPLY.

INCREASED PRICE OF GAS—PROPOSAL TO ABOLISH METER-RENTS.

At a Special Meeting of the Leeds Borough County Council last Wednesday—the MAYOR (Alderman Emsley) presiding—the above questions were introduced for consideration.

Alderman GILSTON, Chairman of the Gas Committee, moved—"That the Council increase the price of gas to consumers within the borough from 1s. 10d. to 2s. 2d. per 1000 feet, and to consumers outside the borough to 2s. 10d. per 1000 feet; such increase to take effect on the 1st of January, 1890." In doing so, he said it was perhaps the most disagreeable resolution he had ever had to propose in the Council. The Committee had striven to keep down the price of gas and the sulphur impurities in it, and to maintain the illuminating power, that they might have not only the cheapest, but the best gas that he knew of on this side of the Tweed. Circumstances for many years had not been in their favour. The fall in the prices of tar and ammonia and the coke remaining on their hands, had left their balance year after year on the wrong side. They had hoped that the prices of these articles would rise; and they had done so. The Committee were receiving the advantage of it; and last year, for the first time for a number of years, they made a profit. But their difficulties were not at an end. In consequence of the advance in wages, the price of coal had been raised. Their estimated consumption f r the present year would not be less than 245,000 tons; and the increase in the price would entail an additional expenditure of £20,000. They had had since then a large demand laid upon them by their men, and the annual cost represented by the increased wages and diminished labour given in return would not be less than £15,000. The increase of 4d. per 1000 cubic feet proposed would give them £32,000 a year, leaving a net loss to them on the £35,000 increased expenditure of £3000 a year. He was glad to say that coke had increased in value, and that the same was the case with tar and ammonia; but there was standing against the department, as the result of a number of years' deficits, no less than £30,000. Seeing that they had been directing the work themselves, and that they depended on the ordinary increase of profits arising from the growth of consumption, they asked the Council to sanction the raising of the price of gas; and they hoped the increased price they would receive for residuals would in a short time give them a sufficient surplus each year to pay off the deficit of £30,000. They had not been losing money all this time. During these years that they had apparently been incurring a deficit of £30,000, they had placed to the credit of the ratepayers nearly £50,000 in the shape of a sinking fund. Their actual loss during all these bad seasons was £70,000. They had had to recoup themselves by economical working and increased consumption. They had been able to overtake the whole of that large sum; and they would have weathered through if it had not been for the two calamities that had come upon them. It might be that they would not be calamities. At this moment there stood to the credit of the ratepayers, arising out of the profit of the gas undertaking, about £178,000. Taking all these things into consideration, they need not much regret that the Council in its wisdom had acquired the right to carry on these works. They had not sought to charge the consumers 6d. or 9d. more than it cost them; but to give to them gas that they could not beat at the price.

Mr. DYSON seconded the motion.

Alderman TATHAM sympathized with the reluctance expressed by the Chairman of the Gas Committee at having to advance the price of gas; but it was a necessary consequence where the prices of labour and material advanced as they had done that the consumer must pay the advance. He only hoped it would not go on to any wild extent, and damage the consumer in that way.

The resolution was carried.

Mr. CARTER subsequently moved—"That gas-meter rents be abolished within the borough on and after the 1st of January, 1890." He said the first reason he had for moving the resolution was that he felt it to be an injustice to charge meter-rents to the small consumers. These small consumers had to pay 15 per cent. in meter-rents; while the large consumers had to pay only 2 or 2½ per cent. If it was an injustice to charge meter-rents, he should like to know why they were imposed. Some of the meters had been in use from twelve to fourteen years; and yet they remained the property of the Corporation. Each meter cost about 16s.; but the consumers had had to pay 3s. a year rent for them, and were now paying 2s. He thought the Gas Committee ought to find their own measure for the article they sold. If the Committee were to charge meter-rents, why should they not be allowed to charge for the service-pipes and for the superintendence of the meters? Such a charge was an injustice; and he thought the present was an opportune time for doing away with it. He believed the deficit which had been mentioned by Alderman Gilston was due to the large discounts given for the ready payment of the money. In fact they had been working on bills, and had been paying large sums to get their bills discounted. If a private firm traded on that principle, it would very soon come to disaster; but fortunately for the Committee, they had the pockets of the ratepayers to fall back upon.

Mr. LISTER seconded the resolution, remarking that he felt it to be a necessity to abolish meter-rents. He agreed with Mr. Carter that the present was the proper time to carry out that abolition.

Alderman SCARR said the question was whether they were prepared to give another 2d. per 1000 cubic feet for their gas supply.

Mr. BATTLE said that Mr. Carter knew very well that the abolition of the meter-rents would represent a loss of about 1¼d. per 1000 cubic feet of gas; and he ought to have moved an amendment to the previous resolution that the price of gas should be 2s. 3¼d. per 1000 cubic feet. That would have been consistent.

After some further discussion, a division was taken, and the motion was rejected.

FURTHER COMPLAINTS AS TO THE QUALITY OF THE GAS AT BRISTOL.—At the meeting of the Bristol Sanitary Authority last Thursday, the Gas Inspector (Mr. B. Kitt) reported that on the 21st ult. he found the illuminating power of the gas was equal to 14·51 candles; being 1·01 candles above the standard. Mr. Levy complained that the gas had been so bad that he had been obliged to use oil-lamps; and in the streets the lights were equally as bad. He was surprised that under the circumstances they had such reports from Mr. Kitt. The Chairman (Mr. J. H. Lockley) said if the city were supplied with gas of the bare standard of illuminating power, it would be only just sufficient to make darkness visible. He did not know how they were going to remedy matters. The fault lay in the Act. Mr. Lloyd suggested that the Committee should have an independent report, to see whether the Gas Company were fulfilling their duties. Mr. Williams asked if it would not be better for a deputation from the Committee to wait on the Directors of the Company, and endeavour to obtain an alteration in the existing state of things. In view of the adoption of the electric light by the city, he thought the Company would come to terms. The matter then dropped.

GAS WORKMEN AND THE LABOUR QUESTION.

IMPENDING STRIKE AT THE SOUTH METROPOLITAN GAS-WORKS—STRIKES AT MANCHESTER AND SALFORD.

The agitation on the part of stokers and other gas workmen for increased wages and improved conditions of labour, which has been going on all over the country for the past eight months, reached a climax last week, the ultimate result of which it is impossible to foresee. Following the plan adopted in recent issues of the JOURNAL, we shall in this column merely chronicle events as they have occurred; leaving comment thereon for another place.

The inhabitants of the Metropolis, especially of that portion of it lying south of the Thames, were startled last Thursday morning by the appearance in large type on the contents bills of all the newspapers of an announcement of a threatened strike of gas stokers in South London. This announcement was called forth by a letter addressed to the papers by Mr. G. Livesey, Chairman of the South Metropolitan Gas Company, stating that just before the usual meeting of the Directors on Wednesday, he received a letter from the Executive of the Gas Workers' Union, in the following terms:—"To George Livesey, Esq., Chairman of the Board of Directors of the South Metropolitan Gas Company.—The following resolution was passed at a meeting of delegates of the Gas Workers' Union, held Dec. 4, 1889:—'That, in the opinion of this meeting of delegates, representing the men of the Gas Workers' Union, the action of the South Metropolitan Gas Company, in forcing upon us to work with men who have signed the bonus scheme (brought out by Mr. G. Livesey), whom we look upon as blacklegs to our Society, is condemned by us as being unjust, unfair, and must be resisted; and that all the men in the South Metropolitan Gas-Works are justified in giving in their notices forthwith, until the same be abolished, and the said men be removed from the works; and that a copy be sent to the Directors.'" In order that the public might fully understand the cause of this action on the part of the Union representatives, Mr. Livesey gave a succinct account of the progress of the labour movement, as far as his Company is concerned, from the granting of the eight hours in June last to the recent proposal for establishing a profit-sharing system in connection with the workmen (see *ante*, p. 928), the details of which have been discussed in our editorial columns. The changes made by the Directors, after the first demands of the men, involved an extra charge to the Company for wages of at least 25 per cent. The men expressed themselves perfectly satisfied with the arrangement, and promised that the work should be done more satisfactorily than ever before. "This promise," Mr. Livesey said, "they certainly have not kept, neither have they been content with the settlement of last June, but have constantly made requests—or rather demands—for further small concessions, which have been granted; so that the aggregate increase in the wages paid by the Company for retort-house labour is not less than 33 per cent." With regard to the latest proposal, he said: "About 1000 of the Company's regular men have signed agreements under this profit-sharing arrangement, and have accepted the strike clause* without question; but in order to remove every objection, and cheered by the hearty response of the 1000 men to their proposal, the Directors have withdrawn this clause absolutely, and have made some other alterations in favour of the men to meet objections raised by the stokers, some of whom have signed agreements, and many more would do so but for the opposition of the leaders of their Union, which opposition has now culminated in the letter received from them to-day. These men, with whom they say they are forced to work, are members of their own Union, and have been working for the Company for periods ranging from one to twenty years." Mr. Livesey concluded by stating that the Directors understood that the stokers would, on the following Friday, give a week's notice to leave their employment, unless their demand for the removal of the men who had signed agreements was complied with. This the Directors had refused, and had determined to use all means in their power to minimize the inconvenience to the public, and at the same time to deliver themselves, their officers, and their loyal men from the tyranny of the Gas Workers' Union. Accompanying the letter were copies of the circular setting forth the details of the profit-sharing scheme and of the agreement proposed to be entered into.

In accordance with the resolution of the Executive, the stokers employed at the various stations of the Company sent in their notices last Thursday; and unless in the interval some reconciliation takes place, the last gang of men will go out at six o'clock next Friday morning. Later in the day the Provisional Strike Committee issued, on behalf of the General Committee, the following statement of their reasons for rejecting the proposed bonus scheme:—"(1) We reject it as being in itself contrary to the spirit of trades unionism, on the ground that the regular men who desire to participate in its benefits are first compelled to bind themselves for twelve months to perform any kind of labour at the wish of the Engineer. (2) We maintain that the Directors have only floated the bonus scheme to counteract the men's legitimate combination for increased privileges; it having been openly stated that those who have given their assent to its conditions would be preferred at the time of shortening of hands. (3) We admit that, on first reading, the scheme seems to contain many advantages; but we would point out that not more than 10 men out of 1800 employed in the carbonizing departments have as yet been attracted by it; the remainder having unanimously sent in their notices, though they have been servants of the Company in many cases for over 15 years. (4) We protest that the men, previous to this scheme, were loyal in their desire to serve the Company faithfully and well, unfettered by a twelve months' agreement, as the frequent length of service sufficiently shows; and we maintain that had the Company offered some rise of wages equivalent to the bonus scheme, the old good feeling on both sides would have been restored and confirmed for the future." The Provisional Committee appealed to their fellow-workmen and the general public in the impending struggle; believing that the solution of the labour question was not to be found in the promise of a bribe offered to men under conditions dictated by their employers, and at the expense of the orderly and legitimate efforts of the men themselves to obtain a greater share of the wealth produced by their own labour. On the same day the following reply was sent by Mr. Livesey to the men's demands:—"The answer of the Directors to the demands made yesterday by the Executive of the Stokers' Union for the removal of the men who have signed the agreement under the profit-sharing arrangement, and for abolishing the arrangement, is that the demands cannot be complied with." This manifesto bore the signatures of W. Wadsworth, J. Brown, A. Mouan, G. Davis, T. Madden, W. Clifford, C. Causton, W. Rudd, R. Marsh, J. Knowles, P. Cameron, and A. Woollen. At a previous meeting of the Strike Committee, the following resolution was passed:—"That it is the opinion of this meeting of representatives

* The clause referred to was contained in the last paragraph of the "Notice" issued by the Directors to the workmen, and specified that the bonus money would be the absolute property of the men, "except in the case of a strike or wilful injury to the Company;" in which cases, and in those only, it would be forfeited by the men guilty of this conduct.—ED. J. G. L.

of workmen in the employment of the South Metropolitan Gas Company that, Mr. Livesey having offered a yearly rise in wages through his profit-sharing scheme, the men are justified in asking for it weekly." The Committee asserted that the bonus scheme was worked to the injury of the men who had not accepted it; that it had been in reality put forward with the express purpose of destroying the Union; that the most profitable and best class of work was given to the men who had accepted the scheme, and that the pay of such men had been increased 6d. a day; and that in all the other Company's works where a bonus scheme had not been started the greatest harmony and good feeling prevailed. The Committee also believed that the Trades Unions generally throughout England would support the men in their present attitude. According to the Company's estimate, the decision of the men involved about 1700 stokers, as distinct from the yard-men, who were believed to be perfectly loyal. The returns of discontents received at the Committee-room of the Old Kent Road Branch of the Gas Workers' Union late on Thursday afternoon slightly exceeded this figure; the total of 1881 at the six stations being thus made up:—Old Kent Road, 486; Vauxhall, 490; East Greenwich, 345; West Greenwich, 200; Rotherhithe, 287; and Bankside, 73. Upwards of 1800 notices, therefore, had been sent in; leaving the Company with about 1100 men to carry on their business. Something like 1000 of these are men who have signed the agreement. The officials of the Company have been actively engaged in procuring men to supplement those who will remain with them; and offers of 5s. 4d. to 5s. 7d. per day for eight hours' work, with a premium of £2 for the first week and £1 for each week during the continuance of the difficulty, have been issued. The new men are to be boarded and lodged on the works; and the necessary police protection will be obtained. In view of these measures on the part of the Company, the Union early commenced picketing, with the result that some recruits intended for the Rotherhithe station were intercepted on Thursday afternoon, lodged for the night, and on Friday sent back again at the expense of the Union. Fortunately the position of the works enables the Directors to transport to their grounds bedsteads and bedding as well as food; and during the day barges laden with provisions arrived at the yards, and their contents were stored. Several unsuccessful attempts were made to prevent this. In the afternoon a rumour gained currency that a large number of hands had been promised to the Company by a contractor; and accordingly extra pickets were despatched to all the stations. The railway stations, river, and Surrey Canal were all closely watched. It was stated in the Union Committee-room on Friday that communications had been opened up with the colliers at the pits whence the Company's supplies are drawn, also with the shippers, railway men, and carmen, with the view of securing their co-operation against the Company. A large meeting of stokers and coal porters was held on Peckham Rye last Sunday, and a resolution passed against the bonus scheme.

The coal porters being concerned in the movement, the General Secretary of the Amalgamated Coal Porters' Union (Mr. Henry) had an interview with the Stokers' Committee on Wednesday; and, in accordance with a decision arrived at by their Executive Committee, the whole of the coal porters employed in the Company's works also sent in notices. They demanded that the Company should pay the Union rates for barge labour—viz., 4d. per ton—instead of 2¾d., and also that they should not be put to work with non-Union men. The Committee had a meeting on the following afternoon, to confirm the sending in of the notices; and a resolution was adopted that, unless the Directors agreed to the men's demands, the coaling of all the stations should be stopped at once. The Committee waited throughout the afternoon for a reply from the Company; but none was received. By Saturday morning, however, the Directors had, we believe, received several letters from porters who had sent in their notices, stating that they had been compelled to do so, though they were satisfied with the terms paid by the Company. The Directors had also received many applications from men employed at other gas-works around London for the places of the Company's porters who decide to go out on strike.

Last Friday representatives of the Press had interviews with Mr. G Livesey on the subject of the impending strike and its cause. He stated that the Directors wished it to be distinctly understood that the profit-sharing scheme which they had introduced was not a compulsory one. Men were at liberty to join in it or not as they thought best. With regard to the threatened action of the coal porters, at the time of the dock strike they came out in sympathy with the dockers; their rate of pay at that time being 3¼d. per ton for filling buckets from the steamer's hold. They then demanded 4d. per ton for the work, and the Engineer of the Company (Mr. Frank Livesey) went to the Coal Exchange and agreed to pay this rate in the case of steamers—nothing being said about barges. The Company's coal at Bankside and Vauxhall is all conveyed in barges; and the price at present paid for filling the buckets is 2¾d. per ton, and the men are now earning from 10s. to 11s. per day by piecework. Filling from barges was far easier than from the hold of steamers, and hence the difference in the price paid. These men were regularly in the Company's employ, and enjoyed all the benefits of the superannuation, sick funds, and holidays the same as others. When they are not employed in unloading coal, they are engaged in the yards at a regular wage. Some time back representatives of these men went to the Directors and told them that the Coal Porters' Union had said that they must have 4d. per hour for unloading barges. The Directors at once stated that they would not pay the price; but if they were forced to do so, the men would not be found employment in the yard when not engaged in unloading. The men preferred to remain as they were. Only a few of these men had sent in notices. The Company are the owners of the barges, lighters, and tugs used in conveying the coal to the various wharves, and also employ their own lightermen. The men employed in this branch have joined in the profit-sharing arrangement, and will remain loyal to the Company. Many of the men who had signed the agreement had sent in their notices; but they had intimated to the Company that they intended to remain. One stoker had written to the Directors saying that he signed the notice as he was in fear of being assaulted; but that he wished to remain in their employ if he was protected. The bonus system had been in force with the clerks, inspectors, and foremen for some years past, and had been found perfectly satisfactory to both sides. The men who had signed agreements had received their certificates; the total amount being between £5000 and £6000.

The Executive Council of the National Union of Gas Workers and General Labourers of Great Britain and Ireland, and delegates from the Coal Porters' Union, met last Friday at the offices of the Union, Barking Road, to consider their position, and draw up a manifesto in reply to Mr. Livesey's letter mentioned above. After a long deliberation, the Council issued a manifesto, the leading points of which are appended—

"With reference to the dispute between the above Union and the Directors of the South Metropolitan Gas Company, we desire to make public the following facts:—

"The matter in dispute, viz., the bonus scheme of Mr. Livesey, which we think would be better designated as the 'Bogus Scheme,' so flimsy is it in its entirety—has been amply discussed at four or five large meetings of the representatives of the members of the Union, with the result that a resolution was passed on Saturday, Nov. 23, by the executive, 'that we look upon the 'bogus scheme' as a base attempt to curtail the liberty of the members of our Union, and that by signing the agreement, as proposed by Mr. Livesey, the men would be doing an action contrary to the principles of trade unionism, and detrimental to the dignity of any working body of men.' This resolution was also carried unanimously at a meeting largely attended by gas workers, on Deptford Broadway, on the Sunday following. Then followed a string of insults and base treatment by Mr. Livesey to the men who could not conscientiously sign their liberty away, by giving those who did sign it positions over those who did not sign it; and also raising their pay 6d. per day, with other promises, to coerce them to his way of thinking. We much question his veracity in stating that 1000 men have signed his agreement; and we have reasons to know that more than two-thirds of those who did sign it did so under protest, similar to what Mr. Livesey on behalf of his Company did when he made his last concession—viz., the double time for Sunday work. Notwithstanding his assertion that they made the concessions to the men cheerfully and willingly, we think the feelings of the men were worked to a point as to when decided action should be taken, in their opinion, through three of the men employed at one of the Metropolitan Gas Company's stations, who, being nearly a quarter in arrears in the Union, signed the bonus agreement, and assumed a threatening attitude towards the other members of the Gas Workers' Union, and until the last two or three days they refused to pay any more money to the said Union, stating that Mr. Livesey would protect them in their action. Now, we will leave the public to judge whether in the interest of a Union consisting of probably, by now, 100,000 members, and which Union, from its start in April last, had done so much to improve the condition of the masses, we were justified in advising that our members should not sign their rights of combination away, nor be gulled by the pretences and promises as set forth by Mr. Livesey's scheme. We may say that with regard to the men making demands periodically for more concessions, as stated by Mr. Livesey, that gentleman has from the first of the negotiations with his men acted in a hostile manner. As an instance, it may be noted that at the last meeting at which the Executive were asked to meet the Chairman and Directors of the various Metropolitan Gas Companies, Mr. Livesey, who was absent, made his absence conspicuous by sending a letter stating that anything that might be conceded to the men would be given by him under protest, and would be taken off again at the first opportunity. His actions up to the present have fully borne out his statements at that time; and it is a fact that since then Mr. Livesey has been preparing to resist the men to the best of his ability in the event of a strike, by building huts and putting in the necessary utensils at the Old Kent Road depot for lodging blacklegs to thwart the objects of the men working under him. In short, whilst he was pretending to give to the men a certain advantage through the bonus scheme with the one hand, with the other he was working to place them entirely under his thumb. The men have refused to follow the red-herring trail as put down by Mr. Livesey to induce them off the track. It has been stated that the men who have signed the bonus scheme have no right to be called blacklegs; but we maintain that the members of any society—trade union especially—forfeit any claim to the protection of a society if by their action they go against the rules as laid down for their guidance, and sign a covenant calculated to injure a society to which they had made allegiance, and from which they had previously reaped benefits.

"We feel that it is hardly necessary for us to make any appeal to the public further than has been made through the criticisms by the morning papers on the letter and information of Mr. Livesey. We think we have reason to be satisfied with the manner in which the papers have so fairly commented upon the whole action of Mr. Livesey towards his men; and venture to predict that, by rushing into print at the first opportunity, and by his eagerness to be first in the field, he has courted the defeat he so richly deserves. We would also like to say a word, in all fairness, for the representatives of the other Gas Companies, whom we have had the honour to meet in conference at the Cannon Street Hotel, and to whom we shall always feel indebted for the kind consideration shown in every possible shape, which cannot be better illustrated than by giving the words of Mr. Jones, the Chairman. Mr. Jones said: 'We recognize that your interests are our interests, that we cannot do without you;' and we have seen that spirit fostered to a large degree in several of the large stations on the north side of the river, and in several cases strangers have not been set to work unless they have been Union men, and the foremen have required that they should show their tickets or else go and get one. There have, we know, been a few petty disputes; but these must naturally be expected from men working under a new system. But the Executive have endeavoured, as far as lay in their power, to carry out the principles as laid down by Mr. Jones, as previously mentioned; and have no reason to be dissatisfied with the result so far. But how different has been the attitude of the employers on the south side of the river! And Mr. Livesey gave his word of honour that he would accept, and work on the same line as the other representatives of Gas Companies assembled at the Cannon Street Hotel. He has gone wide of the mark, and, we think, forfeited the confidence formerly placed in him by his men and the community at large. We have at various meetings tried to think out some other method of getting over the stumbling-block thrown in our way by Mr. Livesey; but are assured that no other means would satisfy our members, nor bring about that 'consummation devoutly to be wished'—the peaceable working of the men on the basis so admirably put in the words of the Chairman at the Cannon Street Hotel. We had reluctantly to decide that in no other way could it be met than by the men at once using that constitutional method of placing in their notices; and on our part we do not fear the result. We are sorry that Mr. Livesey has so deliberately and designedly forced this upon us; but we must not allow Mr. Livesey to dictate to us in the manner he wishes to do. We hold an Executive meeting this afternoon, and have invited the Executive of the Coal Porters' Union to meet us, as they have made their cause one with ours, and as they are similarly fixed as regards the bonus scheme.

"With regard to the manifesto as put out by the Provisional Strike Committee, we, the Executive, agree; but we notice that they state that the Union demand the equivalent of the bonus in the shape of weekly wages. To this we would say that the opinion of the whole members of the Union has not been taken on this question, and that we would not sanction anything being ascribed to the Union until an expression of its views had been sought and given in accordance with the rules of the society. That such a resolution was passed on the south side we do not deny, nor do we wish to offer any opinion as to it being eventually asked for by the men who have tendered their notices; but, pending the usual course, we must have things straight and aboveboard, so that no misunderstanding may arise."

The document was signed by Mark Hutchins (President), John Walsh, Owen Crummey, Joseph Bracey, W. Canty, Frank Cameron, Fredk. Adams, W. J. Gardner, F. T. Reader, W. Byford, and W. Thomas (General Secretary).

Commenting on this manifesto on Saturday morning, the *Standard* said: "We regret that the framers of the manifesto have prejudiced their cause by the use of vehement language, when, on their own showing, there is not the smallest excuse for it. But this extravagance must be attributed to the artlessness with which the document has been drafted. The Secretaries are, apparently, too busy in looking after the strike at Manchester to attend to literary matters; and the duty of composition has accordingly devolved upon someone who mistakes strong language for consciousness of right. Even if the bonus scheme has been conceived with a view to tempt the men from absolute devotion to the Union leaders, it would be preposterous to call it a 'base attempt' to curtail their liberties. The offer was made—the men were free to accept or reject it; and those who claim on behalf of the workmen the right to act in concert, cannot rationally impute it to the Company as a crime that they tender an alternative to a system which admittedly has not secured absolute accord. It is not denied that Mr. Livesey's proposal promised singular advantages to the men. Though the manifesto, with a misplaced effort at sarcasm, calls it a 'bogus' not a bonus scheme, the only objection to it seriously advanced is the magnitude of the inducement offered to break away from the Union. To denounce it as a 'bribe' is to beg the whole question. The Executive argue—reasonably enough from their point of view—that the twelve months' engagement would tend to abridge that absolute liberty of action which they think it indispensable to secure to the wage-earner. It is true that Mr. Livesey has not made the enjoyment of the benefits stipulated contingent on withdrawal from the Union; and that he has pledged himself to allow any workman to leave the Company's service on the ordinary terms, provided only no grave injury be caused by sudden withdrawal. Thus, the essential objection of the Executive of the Union is confessedly based on their belief that the new arrangement would undermine their hold upon the men. That is the meaning of their declaration that to sign the agreement would be detrimental to the dignity of any body of workers. Realizing that this is their leading idea, we have a key to the interpretation of their allegations as to special grievances. The 'string of insults and base treatment' to which non-signers are said to have been subjected would resolve itself into the satisfaction expressed by those who had embraced the employers' offer. As to the want of 'veracity' ascribed to Mr. Livesey, we have no confirmatory evidence. He says a thousand men have signed the agreement; the Executive doubt it, and are ready to swear that two-thirds of those who assented did so under protest. Unhappily, the obvious inconsistencies in the narrative do not inspire confidence in the discernment of the Union leaders. In one place they reproach Mr. Livesey with having written to say (at the time of the earlier difference) that if the other Companies decided on making concessions, he would follow suit, only under protest. But elsewhere the charge against Mr. Livesey is that, having solemnly vowed to be as liberal as his fellow-Managers, he nevertheless made preparations in anticipation of a strike. Nor does it altogether commend the views of the Executive that they complain that three men who signed have ceased to pay up to the Union funds, because a foreman who was one of their delegates has been since persuaded to use his influence in favour of the Directors' policy. To put the matter in a nut-shell, the Company wish to try the plan of partnership in earnings without too tender a regard for its effect on the vitality of the trade organization; while the Union officials are up in arms to maintain inviolate the present apparatus for bringing combined pressure to bear on employers. It is the collision, so far, of two antagonistic principles, for and against each of which much may reasonably be said. If those who are immediately interested cannot come to terms, they must fight it out. But if the struggle cannot be averted, it is the duty of the public to see that the scales are not unfairly weighted against either party; and that, however opinions may vary as to the merits of the quarrel, each and every one interested shall be secured, by the exercise of any force that may be necessary, in the enjoyment of the fullest measure of his legal rights."

The following appeared in the *Metropolitan* last Saturday:—"Our sympathies are with the South Metropolitan Gas Company in their dispute with the Gas Stokers' Union. London gas consumers owe much to the public spirit and enterprise of Mr. George Livesey; and he certainly has good reason to expect that if the threatened struggle does take place, public feeling will not be against the Company. His profit-sharing scheme was designed to secure to the workmen a real and appreciable share in the prosperity of the Company; and having regard also to other recent reforms in the Company's labour arrangements, especially in the adoption of the eight-hour system, there are absolutely no grounds whatever for any suggestion of unfair or illiberal treatment. Indeed, we feel convinced that could the real views of the men themselves be ascertained, by far the great majority of them would be the first to acknowledge that, instead of there being any cause for a strike, they would rather be disposed to thank the Board for the vastly improved terms offered them. But, unfortunately, certain officials, supposed to represent the men, have interests to serve by no means consistent with those of the men on whose behalf they now presume to act. Those behind the scenes know pretty well that parties who have the principal voice in directing strikes of this character certainly do not share the privations which fall to the lot of the unhappy workmen and their still more unhappy families. We would hope that even now the *employés* of the Company will have the independence and the manliness to act as both interest and duty suggest. But if the notices said to have been delivered be acted upon, we trust the Directors will not recede from the position they have taken up; and we feel confident they will have the support of the public."

The Gas Committee of the Manchester Corporation, on the outbreak of the second dispute with their men (*ante*, pp. 1022, 1071), had meetings daily in order to deal with the difficulty. Early last week it was stated that their advertisements for men had resulted in more applications than they expected being received—the majority from local men, but in some cases from distant places. At the meeting of the City Council last Wednesday, a report was presented by the Gas Sub-Committee stating that the time fixed by the Committee, and approved by the Council, for the men to withdraw their notices to leave work having expired on the previous Friday, without such notices having been withdrawn, it had become the duty of the Committee to fill up the places with fresh men; and the Sub-Committees of the various stations had been instructed to take all necessary steps to carry on the works with a view to giving as little inconvenience as possible to the public. Sir J. Harwood having moved the adoption of the report, Mr. Mainwaring remarked that, as one who took an active part in obtaining the previous demands of the gas workers, he wished to express his regret that the men had not thought it advisable to withdraw their notices. He believed the men had put themselves, practically speaking, in the hands of agitators; and they would regret the position in which they had been placed. Mr. Chesters-Thompson said that whatever the men had done they had done with their eyes wide open. The Mayor (Mr. Alderman Mark) said he hoped Mr. Mainwaring would see that it was not advisable to proceed any further. The report was adopted. Subsequently, on the minutes of the General Purposes Committee coming up for consideration and approval, Mr. Birkbeck referred to the strike of gas workmen. He said that the men in handing in their notices did not do so voluntarily; pressure being brought to bear upon them by agitators. Only three days' notice was given to the men to withdraw their notices; and he scarcely thought this was sufficient time for them to meet together and consider what steps they should take. There was a disposition on the part of the men to withdraw their notices; and he thought the Gas Committee ought to allow them to withdraw them even at the eleventh hour. (No, no.) Some of the men had approached him; and it was evident to him that they had been influenced against their own wishes. Alderman Harwood said a discussion on the subject was exceedingly undesirable. The decision of the Gas Committee was one which everybody could understand. They must carry on the business of the Department; and they had engaged a large number of men upon a contract for four months. They could not discharge these men; they must pay the wages of every individual man who was employed at the gas-works. Up to the present moment every man who withdrew his notice was put down upon the list as one of the first men to be engaged when the notice expired. But the men who were engaged upon a four months' contract could not, under any circumstances, be discharged or interfered with; and it was quite clear that a number of the men could not be taken on again. Of course, they were very sorry for these men. The proceedings were confirmed. The newly-engaged hands proceeded to the works on Thursday afternoon, escorted by strong bodies of police, and followed by large and excited crowds. Provision was made in the yards of the works to accommodate the men; huts having been erected, and large quantities of food stored. The Gas Committee curtailed the supply of gas in all the departments under the control of the Corporation, and urged upon the ratepayers to follow their example. At Rochdale Road, about 300 men were taken into the works; and at the Gaythorn station about 200 were conveyed in by the railway connections. Something like 120 of the old hands and all the old foremen remained in the service; so that the new hands had competent instructors. The police were on duty in large numbers at the works. Several meetings of the men have been held; and their leaders have issued a manifesto, in the course of which it is stated: "It is incorrect to say that we have asked the Gas Committee to discharge any man or any number of men; we simply requested to amicably settle the matter, so as to enable us to work in harmony with our employers." This appeal, which is addressed to the ratepayers "for justice," further states that deputations had waited upon the Mayors of Manchester and Salford with a view of coming to some amicable arrangement; but the answer they received was, "It is too late; the whole of the men will have to come out and take their chance at the gate with other men." The men held an open-air meeting, at which the conduct of the Corporation was vehemently condemned. The speakers urged the men on no account to give way, because the Union was quite strong enough to support them in the struggle. Although the new hands worked very well, the production of gas on Friday was much below the requirements of the public; and the pressure was greatly reduced. A fog compelled almost all the great business establishments to use artificial light; and the gas had to be supplemented by lamps and candles. Only half the lamps in the city were lighted. The number of new hands was slightly increased on Friday; and at the various works everything was going on as satisfactorily as could be expected. Friday over, and with the short Saturday and Sunday before them, the Gas Committee entertained a confident hope of being able to resume the full supply in the course of a few days.

In the adjoining borough of Salford, the agitation, commenced in sympathy with the movement in Manchester, was carried to the "bitter end." On Tuesday morning a small deputation, representing the Gas Workers' Union, had an interview in the Town Hall with the Mayor (Mr. B. Robinson), the Chairman of the Gas Committee (Mr. H. Lord), and the Deputy-Chairman (Mr. Holland) with reference to the dispute. The deputation consisted of Mr. W. Horrocks (Organizing Secretary), Mr. W. Thorne (General Secretary of the Union), and another. Their object was to ascertain whether or not the Corporation would allow the men who had given notice to withdraw; and whether, in the event of such withdrawal taking place, the men might rest assured that those who had taken part in the present agitation would not be subjected to exceptional treatment when the winter season was over. The delegates were asked if the men were willing to work with non-Union men, and their reply was that they would not, so far as the carbonizing department was concerned; and when it was explained that a number of new men had been engaged to take the places of those on notice, the deputation gave his Worship to understand that in that case the men could not think of withdrawing. Before leaving, the delegates were informed that a special meeting of the Gas Committee would be held in the evening; and it was arranged that a deputation representing them should attend at the Town Hall to learn the decision. There was a good attendance of the members of the Committee at the special meeting; and the conclusion come to, after a great deal of discussion, was that none of the men should be allowed to withdraw their notice, but that the Committee would be prepared to consider applications from such of the men as desired to continue in the service of the Corporation. The deliberations of the Committee came to a close shortly after seven o'clock; but the Chairman and the Deputy-Chairman, with whom were the Town Clerk and the Gas Engineer (Mr. S. Y. Shoubridge), remained to inform the deputation of Union men of the result. The Committee, we understand, had a large number of applicants for employment at the gas-works, and suitable arrangements were made to afford the new hands proper protection from interference by the men on strike. One-third of the stokers at the Bloom Street and Regent Road works, numbering about 40, left at ten o'clock on Thursday night—the usual time for changing shifts. The second batch—a still larger one—finished duty at six on the following morning; and the remainder about two o'clock on Friday afternoon. Every day last week the offices in Bloom Street were besieged with men seeking work, and a large number were selected. Both at Bloom Street and at Regent Road, sleeping accommodation has been provided, and arrangements made for provisioning the men, a large body of whom were taken into the works on Friday under police escort.

USK WATER-WORKS COMPANY, LIMITED.—A Company under this title has been registered with a capital of £4000, in £5 shares, to supply Usk, in Monmouthshire, and the neighbourhood with water, and to carry on the business of a Water Company in all its branches.

ADVANCE IN THE PRICE OF GAS AT HALIFAX.—At the meeting of the Halifax Town Council last Wednesday, Mr. Brook proposed that the price of gas be increased from 1s. 11d. to 2s. 2d. per 1000 cubic feet. Mr. Brear seconded the motion. The reasons for the proposed increase were stated to be: The rise in the price of coal, the unusual expenses at the works, the consumption of gas not having been so great as anticipated, and therefore that the estimated profits had not been realized. An amendment was proposed that the matter be referred to the Gas Committee; but the resolution was eventually adopted by a large majority.

THE AFFAIRS OF THE NOTTINGHAM AND DERBY WATER GAS COMPANY, LIMITED.

The Directors' Defence.

In the Journal last week (p. 1074) we recorded the result of the extraordinary meeting of the Nottingham and Derby Water Gas Company, held on the 30th ult., for the confirmation of the resolutions passed at a previous meeting to wind up the Company voluntarily, and appoint liquidators. It may be remembered that these propositions were agreed to; the Chairman (Mr. Alderman Goldschmidt), Mr. C. J. Cox, Mr. J. T. M'Craith, and Mr. A. L. Wilson being selected. On that occasion, the Chairman took the opportunity of offering to the proprietors some explanation of the conduct of the local Directors of the undertaking, which was rather severely criticized by Mr. Justice Stirling when the motion to prevent the confirmation of the resolution for winding up was before him (see *ante*, p. 1066). He commenced by remarking that if his Lordship had had cognizance of all the particulars, these strictures would not have been passed. The first and chief complaint which was made against the Nottingham Directors was that they had accepted a bribe at the hands of Mr. Cottam. He told them on the last occasion that Mr. Cottam offered to Mr. Cox and himself 200 shares each in the parent Company at par at a time when they were quoted, or reported to be quoted, at 4½ premium. Mr. Cottam, no doubt, had a strong interest in connecting in that way the subsidiary Company with the parent Company, from which all information was to be derived, and which was to make all plans, if any were required, for the Nottingham Company. Mr. Cottam offered them the shares in question at par, knowing that they would not buy them at the premium at which they stood. The shares rose marvellously in value, in a manner which no one could understand or explain. Mr. Cox and himself knew that any profit they might derive from the purchase of these shares would have to go to the Nottingham Company, and that, on the other hand, they would have to bear any loss on them. As he stated at the last meeting and at a Board meeting in Nottingham in May, he had never intended to keep a penny of the profit derived from these shares, nor had his colleague. If he correctly understood the word "bribed," a man who was bribed was supposed to do the bidding of the briber, whether he considered it right or wrong. Now, had the Nottingham Directors done so? ("No.") From the very first moment when they found that everything was not as it ought to be in connection with the Company, they resolved to contest the validity of the agreement at any cost to themselves. If, however, they had been bribed, if they had studied their own interest and comfort, the easiest thing for them would have been to pay to the parent Company £50,000 in cash, to carry on the undertaking for five or six years, to draw their fees, and then, when there was not a penny left, to say that the Company must go into liquidation. Instead of doing this, they had sacrificed their own comfort and interest; and, as they knew would be the case, their reputation had been attacked on all sides. Still they had submitted to this, in order to save the Company's interests. At the present moment they were in the proud position of being able to tell the shareholders that not only was the whole of the capital intact, but if they added the profit derived from the sale of the shares referred to, they would be able to pay all the expenses without calling upon the shareholders to contribute a penny. Had they, therefore, acted in the interests of the shareholders or not? The Yorkshire Company had paid their money; and where were the works to which that Company could point? As to what the parent Company had done, when Mr. Samson Fox was under cross-examination the other day, he was asked how many water-gas plants there were in England besides that at the Leeds Forge; and, under the advice of his Counsel, he declined to answer. The North British Company, too, had parted with £110,000; and he asserted that not a single plant had been put down by them, although that Company was formed only a week after their own. In face of these facts, he asked the shareholders whether the Directors of the Nottingham Company were to be condemned as bribed and untrustworthy men. He believed they would say, on the contrary, that the Directors had done all they could to protect the interests of the Company. Another charge brought against them was that they had not been diligent enough in making inquiries as to the merits or demerits of water gas. He wished them to understand that at the time the Company was formed—and he believed it was so now—the only water-gas plant in existence in England was that at the Leeds Forge. The Directors went there, and were greatly impressed with what they saw. At the time in question there was a kind of fever raging in this country as to water-gas shares; and if everyone outside was mad, the shareholders, they thought, could not complain if the madness had extended to the Directors. They thought they "had hold of a good thing;" and they did everything they could, in the circumstances, to make diligent inquiries. It was not for the Syndicate to complain that they had not done so, because if they had been misled in anything, it had been by the Syndicate. A great point, too, had been made of this—that he had bought shares in the Nottingham Company. He was not, however, aware of any law, moral or otherwise, which prevented a Director from dealing in the shares of his own Company. The only shares he bought were 225 in July last; and these he had sold. He had further bought 150 shares—also openly, through the Company's broker, who wrote to the Secretary, asking that gentleman if he could find a customer for 150 shares. For the credit of the Company, he (the Chairman) bought them, so as not to have them offered about the market. He had bought them at 5s. each; and thousands had been bought at that price, and even less. It had been said that because he held those shares, and wished to derive a great benefit from them, he desired to wreck the Company. Such an idea was ridiculous. If they could get free from their agreement with the parent Company, and could at once pay back the shareholders their money, he would, of course, derive a profit on the 150 shares in question; but they had not yet arrived at this stage. If they lost the main action brought against them by the parent Company, there must be a further call of £2 a share; and the 150 shares would then cost him £2 5s. each. In the event of an adverse decision, the present capital in hand would be swallowed up by the £50,000 which would have to be paid to the parent Company and by the law costs; and the final call of £40,000 would have to be divided among the 30,000 shares. Instead of making a profit, he would thus lose at least £1 5s. per share on the 150 shares; and this risk he had taken along with his chance of a profit. Was it likely that he wished to wreck the Company for the sake of these 150 shares, when he was a holder, as an original allottee, of 250 shares, upon each of which he had paid £2 10s.? He had believed in the *bona fides* and in the future of water gas; otherwise he would not, at the outset, have taken 250 shares when his qualification as a Director was only 100 shares. After the explanation he had given, he trusted the shareholders would pass a vote that day freeing the Directors from the imputations which had been thrown upon them, and which they felt most keenly. Mr. C. J. Cox said he also wished to clear himself from the reflections which had been cast upon him by Mr. Justice Stirling. In connection with the shares in the parent Company, which Mr. Goldschmidt and he had bought at par when they were at a premium, he desired to affirm again that they quite understood that if any profit accrued from the sale of the shares, the benefit would belong to the Company, if the shareholders wished it. He agreed with the Chairman that it would have been very absurd to buy the shares at a premium. At the meeting at the Holborn Viaduct Hotel, they flatly refused all the efforts that were made to induce them to pay the £30,000 that was demanded on account; and at that time they did not possess the shares through which it had been said they had been bribed. They had, however, acted throughout in the shareholders' interests; and the idea of a bribe had never entered their heads. The Judge had said that the shareholders must be careful into whose hands they put the liquidation of the Company. If they thought that the Directors were not fit for the position of liquidators, let them say so; but he hoped, on the contrary, that they would be able to pass a resolution stating that the Directors left the room without a blot on their characters. Mr. J. T. M'Craith confirmed the statements of his two colleagues, whose acts he asked the meeting to consider in the light of their after conduct. Mr. Cox said he desired to add a few words. A proposal was made by the British Water Gas Syndicate that a sum of £30,000 should be paid by the Nottingham Company in lieu of £50,000; a very considerable deduction being also made in respect of the "B" shares. This proposal was brought before the statutory meeting of the shareholders; but it waited for confirmation and also for certain reports in respect of the patents. When these reports came in, they altered the Directors' views very materially. Although it had been said that he had been bribed, he wished the shareholders to understand that he voted against the acceptance by the Directors of the proposal in question, being determined that not a penny of the shareholders' money should be spent in connection with water gas. As the proposal was put before the shareholders at the statutory meeting, some of them might think that he had not done his duty in not disclaiming it at that meeting; but his reply was that he had simply deferred in this matter to the views of his co-Directors. A resolution was passed expressive of the entire confidence of the shareholders in Alderman Goldschmidt and Mr. Cox; it being the opinion of the meeting that no imputation rested upon their characters in respect of their conduct in the affairs of the Company.

Last Saturday, an application was made to Mr. Justice Stirling that the voluntary winding-up of the Company decided upon by the shareholders might be continued under the supervision of the Court; the matter to be referred to Chambers for the appointment of liquidators. It was stated that Mr. Alderman Goldschmidt and Mr. Cox were quite willing to resign if a shadow of doubt existed as to their fitness for the duties they had assumed; but the other two liquidators were willing to continue in office. His Lordship made an Order as requested; the appointment of liquidators being left entirely open.

THE BARNSLEY GAS COMPANY AND THEIR CONSUMERS.

No Case for Quarter Sessions.

The memorial presented to the Barnsley Town Council from upwards of 500 large gas consumers, praying that application be made to the Court of Quarter Sessions for an order to appoint an Auditor to examine the accounts of the Gas Company, to ascertain what deviations, if any, from the terms of their Acts of Parliament have been made adverse to the interests of gas consumers, came before the Park and Lighting Committee last Friday week. The Town Clerk (Mr. H. Horsfield) submitted a statement, showing that the published accounts of the Company give the profits for 1888 as £6969; and it appears that on Dec. 31, 1888, the share capital consisted of £40,000 general capital stock, £10,000 "C" (preference) shares, £20,000 "D" shares, £10,000 "E" shares, £10,000 "F" shares, £6000 "G" shares—total, £96,000; and £3000 borrowed on mortgage. The Company have a reserve fund of £3931. The prescribed rate of profits is: 10 per cent. on the capital stock, 6 per cent. on the "C" shares, 7 per cent. on the "D" shares, 7 per cent. on the "E" shares, and 7 per cent. on the "G" shares, and on the "F" shares probably also 7 per cent.; but, said the Town Clerk, by an ingenious interpretation of the Companies' Clauses Act, 1845, the Company claim to be entitled to pay 10 per cent. on the "F" shares. It is very probable, he continues, that this ingenious interpretation is erroneous, and that the payment of 10 per cent. on these shares would be illegal, because the prescribed rate, as above stated, is 7 per cent. only. The above rate of profits on the capital stock is prescribed by section 30 of the Gas-Works Clauses Act, 1847; and as to the remaining share capital, by section 10 of the Act of 1867. The Town Clerk observes that the amount of profits during the past year was not sufficient to pay the maximum dividend, nor does it appear that the maximum dividend has been paid since 1880. To pay the maximum dividend, the sum of £7820 at least would be required; and, as previously stated, the profits last year amounted to only £6969. The published accounts of the Company do not state what rate per cent. dividend was paid on the several classes of stock and shares; but the Town Clerk is informed on good authority that the actual rate of dividends paid was: 8 per cent. on the capital stock and "F" shares, 7 per cent. on the "D," "E," and "G" shares, and 6 per cent. on the preference or "C" shares. That is, the maximum dividend was paid on all the shares except the capital stock, and perhaps the "F" shares; and the only instance in which the prescribed rate may have been exceeded is in the "F" shares, and that to the extent of 1 per cent. When it is considered that an additional 2 per cent. dividend might have been legally paid on the capital stock, it is evident that, as a matter of fact, the prescribed rate of profits for the preceding year has not been actually exceeded upon the whole of the stock and shares of the Company. It is also remarked that the Gas Company have not paid dividends free of income-tax since July, 1881, but appear to have deducted the amount of tax from the dividends. Therefore the Town Clerk was compelled to come to the conclusion that there was not sufficient ground to apply to the Court of Quarter Sessions for the appointment of an Accountant, and that if the application were made the Court would probably refuse it; and further, that even if the Court were to grant the application, and the accounts were to be found as above briefly indicated, the Council would probably have to pay the costs of the application. This report and the petition were fully considered by the Committee, who stated that they "much regretted" they could not recommend the Council to accede to the request of the memorialists.

A Meeting of the Town Council was held last Tuesday—the Mayor (Alderman Wood) presiding—when a letter was read by the Town Clerk from the Gas Company stating that, much to their regret, they could not meet the views of the consumers by withdrawing the notice to increase the price of gas. In the record of the proceedings of the Park and Lighting Committee was a minute recommending that the contract with the Company for lighting the public lamps in the borough be terminated, and that notice be given to determine the same on June 30 next; but after a little conversational discussion this was withdrawn. Mr. Wray then moved the confirmation of the rest of the minutes. The Committee, he said, had considered the memorial signed by 500 consumers; and they felt sorry they had not any grounds upon which to go to Quarter Sessions, although they believed that the Company in 1881 exceeded their powers. But they were thoroughly satisfied they had not done so during the past year. The Act of Parliament said that no action must be taken except in respect to the profits made in the preceding year. The Company, they believed, took something like £1000 less than they had power to do; therefore it was no use asking the Council to proceed with the petition.

They had great sympathy with the petitioners; but when they came to consider the Acts of Parliament, they discovered they had no legal ground to stand upon. They found, according to the accounts of the Company, that they made £12,000 in round figures. They asked relief from the Company; but they saw there was no hope of getting it. They then called a public meeting, which was attended by 2000 persons. The meeting was convened in proper manner, and presided over by the Mayor. They appealed to the Directors; but all they got was an insult from the Chairman of the Company. They then tried to meet the Company. A deputation of the Council attended before the Directors; and the simple reply they got, to his way of looking at it, was: "If you don't like it, you must lump it; you will get no relief." They received a letter from the Company, which did not show why the gas should be 20 or 30 per cent. dearer than in many other towns. Then the Committee came to the conclusion, after they had tried all fair means, that there was only one way left, and that was for the Council to take up the question of lighting the town in some other way. He moved the adoption of the minutes. The motion having been seconded, a lengthy discussion followed on the question of extending the area proposed for electric lighting purposes, when a satisfactory answer was given by the Borough Surveyor, who pointed out that the Council had power, by passing a special resolution, to put down a wire to any of the districts beyond the inner area. Mr. Waddington, referring to the gas consumers' memorial, said his mind was thoroughly made up as to the cause of dear gas in Barnsley; but they would not do any good by appealing to Quarter Sessions. Those who sunk their money in the concern had ingeniously protected themselves by Acts of Parliament. It was not possible that reasonable dividends could be paid with a plant costing £96,000, which was sufficient to supply 80,000 inhabitants. Alderman Marsden admitted that the Company put down good plant, which would supply a town double the size of Barnsley. He did not think they had spent £1000 more than any man who possessed capital and brains would do. The minutes were agreed to; and a memorial was ordered to be sent to the Board of Trade with regard to electric lighting. The Town Clerk said the amount proposed to be raised for electric lighting was £33,000, and it was intended to raise the money on the local rates and from the local authorities.

THE ELECTRIC LIGHTING SCHEME FOR THE CITY OF LONDON.

At the Meeting of the Commissioners of Sewers of the City of London last Tuesday—Mr. G. Manners in the chair—a report was presented from the Streets Committee relative to the tenders for electric lighting, and recommending that, inasmuch as the tender of the Anglo-American Brush Electric Light Corporation was in accordance with the specification issued, which was based upon the conditions agreed to by the Commissioners in February last, a contract be entered into with that Corporation for lighting the central district, comprising the south and east sides of St. Paul's Cathedral, and the area eastward to the end of the Poultry, and containing 138 lamps.

Mr. Day, in moving the adoption of the report, remarked that at the next meeting the Committee hoped to bring up another dealing with the east and west districts. The contract was for 21 years, terminable at the end of 7 or 14 years; and the price was £26 per annum for arc lamps.

Mr. Harris said this was an important variation, as in the original specification the term was for 21 years only. Were the Commission dropping the conditions as to penalty, so as to get a reduction from £30 to £26?

Mr. Day said the £26 was subject to all the conditions.

Mr. Harris asked if the Commission would be able to take over the works at the end of 21 years at a fair market value?

Mr. Day: According to clause 40, "power is to be reserved to the Commission to acquire the undertaking and works by purchase at the end of 21 years, or each succeeding seven years, on giving six months' notice, in accordance with section 2 of the Electric Lighting Act, 1888." The Anglo-American Brush Corporation agreed to this clause.

Mr. Harris proceeded to criticize the scheme. He said public lighting was only as "a drop in the ocean;" whereas if they agreed to this scheme, the Corporation who were about to apply for a Provisional Order might get the private lighting over the whole area of the City. Did they intend to oppose the Order? or would they give an absolute monopoly to this Company for ever? The Committee said nothing about what they would have to pay the Gas Company for the disused lamps, for maintaining, cleaning, and lighting them, and keeping them in repair. For the side streets they would require incandescent lamps at a largely-increased cost; but nothing was said about this. In the matter of private lighting, they were behind the other London authorities. The illuminating power of the arc light was said to be 32 times that of gas. But this was a pure fiction, as it never was two seconds alike; and the opal globe took away 50 per cent. of the light. He objected to giving possession of the centre of the City to any Company while they were free from statutory obligations. He moved, as an amendment, that the report be referred back to the Committee.

Mr. Bowring seconded the amendment.

Mr. Pannell said, having been intimately associated with the electric lighting question since it was first discussed in the Commission seven or eight years ago, he thoroughly agreed with the recommendation of the Committee. In his opinion, they ought to show that they really meant to afford people an opportunity of pressing forward electric lighting in the City of London.

Mr. Bowring asked if there were any conditions as to private lighting.

The Chairman said there were.

Only Mr. Harris voted for the amendment; and the report was accordingly adopted.

Improved Public Lighting in Stoke Newington.—The two Local Authorities who rule the destinies of Hackney and Stoke Newington have lately been disputing over the question of spending a little money in extending the public lighting of the district. A short time ago the Hackney Board of Works, which represents Stoke Newington for district purposes, decided to lay out £804 on improving the condition of the street-lighting plant, and to increase the consumption of gas to the amount of £655, in Hackney; also to expend about £1000 for similar purposes in Stoke Newington. This decision does not appear to have given satisfaction to the Stoke Newington Vestry, which is represented at the District Board by six members; and consequently, at their next monthly meeting after the resolution had been passed by the Hackney Board, they came to the conclusion that it was inexpedient at present to improve the lighting. At a recent meeting of the District Board, one of the representatives of the Vestry tried to obtain the rescission of the original resolution, except in so far as it related to new roads. The arguments adduced in support of this proceeding were mainly that Stoke Newington did not desire to incur increased expenditure for public lighting; and that it was possible that the electric light would, in the not distant future, be employed for the public thoroughfares. In the result, however, the Vestry were defeated; and consequently the improved lighting will be proceeded with.

NOTES FROM SCOTLAND.

(from our Edinburgh correspondent.)

Edinburgh, *Saturday.*

I am afraid I have little to say upon gas topics this week. The troubles which afflict gas managers in your neighbourhood happily, thanks to careful management, do not exist in these parts; though there is no saying how soon the Union may see fit to interfere here also. There will probably be an attempt made, at all events, to obtain assistance from the toilers in gas-works on this side of the Border, for their misguided brethren in the South. The only safeguard against this lies, of course, in the intelligence of the northern workmen, who cannot fail to see that the London men are foolishly flying in the teeth of a liberal offer by their employers. They will also, doubtless, recollect that in any dispute which they have had with their own employers, assistance from the South was never vouchsafed to them; and they may also conclude that, having been made comfortable themselves, there is no call upon them to endanger their own position by needless interference in the affairs of others. Except among the miners, the mania for increased wages seems to be dying out; and if that should be the case, a period of quiescence, in which trade would be allowed to flourish, might be expected. A continuance of the present agitation would effectually put a check upon home trade, by driving manufacturers to other countries where production is cheaper. This could not be accomplished in the case of gas making; but there is such a thing as mechanical stoking, and the owners of gas-works will not be slow to introduce it if the pay-bills of their *employés* should become too large.

At Tuesday's meeting of the Edinburgh Town Council, Mr. Auldjo Jamieson, whose absence from the Gas Commission I noticed last week, requested to be relieved from office as a Commissioner, and Mr. Bryden was elected in his stead. It is a pity that Mr. Jamieson, the former critic of the Town Council in the matter of gas management, did not allow himself to become a member of the Commission, because one would then have had an opportunity of judging of his methods of conducting the undertaking. Perhaps he is too old a bird to be caught in that trap; and if that be so, his resignation is rather a tribute than otherwise to the policy of the Councillors during the difficult times of the transfer negotiations.

At Leith Town Council on Tuesday, Bailie Archibald, one of the leading members of the Gas Commission, delivered a stirring speech on the folly of allowing electric lighting powers to get into other hands than their own; and on his motion the Council agreed to co-operate with the Corporation of Edinburgh and the Gas Commission in whatever policy they may adopt to preserve their rights.

Dr. Hopkinson, of London, has been in Dundee this week, advising the authorities upon the subject of electric lighting. Stated shortly, he is in favour of low tension, and believes that with it, plant to supply 1000 lamps would cost £5500. For 2000 lamps, the cost would be from 25 to 30 per cent. more; and if they could keep from 5000 to 10,000 lamps going, the cost would be as cheap as gas. With 1000 lamps the charge would be 5d. per Board of Trade unit; whereas with from 5000 to 10,000 it would be 3½d. A high-tension plant for 1000 lamps would cost £7000. If the low tension principle were adopted, he believes that power could be furnished for light work at a cheaper rate than by a gas-engine. He is to send in a detailed report.

The Aberdeen Town Council on Tuesday had before it the report by the Gas Committee upon the proposed introduction of electric lighting, referred to in my last week's "Notes," and adopted it without remark. In addition to what I mentioned last week, the report stated that it had been ascertained that the Board of Trade had intimated that they intended to discourage all applications for Special Acts. The Committee considered that if that view were given effect to, it would prevent the Town Council making the electric light undertaking a joint undertaking with their gas undertaking, and borrowing money upon the security of the gas-works or the gas contingency guarantee rate. Money for electric lighting would require to be raised by the Police Commissioners upon the security of the general purposes assessment; and under these circumstances they had deemed it advisable to give notices both for a Bill and a Provisional Order, to keep matters open for discussion. The Committee had also agreed to a proposal that a combined representation should be made to the Board of Trade with the view of urging an amendment of the Electric Lighting Acts, so as to remove the difficulties which all the Corporations feel in taking the matter up. The report to the Committee of a deputation which had visited electric lighting stations in London, stated that electrical engineers were of opinion it was not reasonable to expect the electric light could ever be produced at much less cost than at present, except in large quantities, as all the sources of loss are known, and are already practically reduced to a minimum. They calculated that to start an electric lighting station in Aberdeen would cost £20,000; and that unless 3000 lamps were kept going, there would be a loss on the undertaking. They recommended that careful inquiry should be made as to the probable demand, before erecting works in Aberdeen; and this sensible advice is likely to be followed. It is to be observed that their calculations differ considerably from Dr. Hopkinson's.

(from our Glasgow correspondent.)

Glasgow, *Saturday.*

The question of electric lighting came before the Glasgow Corporation at the monthly meeting of that body held on Thursday. In the minutes of the Gas Committee, it was stated that the ex-Lord Provost (Sir J. King) and the Town Clerk had some time ago had an interview with the Board of Trade in reference to several points which required elucidation in view of the Corporation applying for powers in regard to electric lighting. The officials of the Board, however, had not been able, owing to various difficulties which had arisen in the working of the Electric Lighting Acts with regard to local authorities in Scotland, to afford any very satisfactory information on the points submitted to them. It was within the knowledge of the Gas Committee that the Lord Advocate had given it as his opinion that the Magistrates and Council, as Commissioners acting under the Police Acts, were the Local Authority for Glasgow under the Electric Lighting Acts. The desire of the Gas Committee, however, was that as regards Glasgow, the Corporation, acting under the Gas Acts, should be constituted the Local Authority under the Electric Lighting Acts; that the gas and electric lighting undertakings should be amalgamated; and that the affairs of both should be administered by one and the same Executive Committee. The minute went on to say that application on behalf of the Corporation had been made to Parliament by a Private Bill and to the Board of Trade in connection with a Provisional Order for electric lighting powers, either as a Municipal Corporation, as the Gas Commissioners, or as the Police Commissioners. It was also indicated in the minute that efforts were to be made to have a joint interview with the Board of Trade by representatives of the Edinburgh, Aberdeen, Dundee, and Glasgow Corporations, so as to determine, if possible, what method of procedure

should be adopted in the coming session of Parliament by those Corporations under the Electric Lighting Acts. To the Special Sub-Committee appointed last December, it was resolved to add other two members of the Gas Committee—namely, Bailie Paton and Bailie Stevenson; the said Sub-Committee to co-operate with the Town Clerk on behalf of the Gas Trust. The minute further stated that it had been resolved to ask for powers to raise a capital of £250,000 for carrying out the electric lighting undertaking. The adoption of the minutes was formally moved by Mr. Ure, Convener of the Works Sub-Committee of the Gas Trust. Mr. W. Wilson directed attention to the fact that there was not a quorum of the Council present. The business now before the Council was the most important of the day; and it was being hurried over in a most unseemly manner. Treasurer Richmond remarked that the proposal in regard to electric lighting involved a sum of £250,000; and it came up for discussion when there was barely a quorum present, though they had spent hours in discussing trifling subjects. They had ground for complaint that the Gas Committee had not put their scheme earlier before the Council. He wished to know who was guiding their Engineer in the matter of electric lighting. Mr. Ure said that the whole question of electric lighting was in a somewhat vague condition just now. They were not perfectly sure whether it was the Gas Committee that should undertake electric lighting; but they were all agreed that the citizens should take it up and prevent any monopoly being established in this matter by outside companies. The sum of £250,000 specifi d was but a small part of the capital that would be needed were the electric light generally installed in the city. If the scheme were married to the gas undertaking, no borrowing powers would be needed at all, as the Gas Trust had ample borrowing powers, which had never been, and which were never likely to be, used. But it was necessary to name a sum to cover all the exigencies of a Parliamentary Bill; and anything less than this they could have little expectation of covering. After some remarks from Mr. M'Laren, the Convener of the Finance Sub-Committee of the Gas Trust, the recommendations of the Gas Committee were agreed to.

At Thursday's meeting of Dumfries Town Council it was reported that at a meeting of the Provost's Committee held on the 16th prox., the notice of the House-to-House Electricity Company to apply to the Board of Trade for a Provisional Order to supply electricity for public and private purposes in Dumfries was under consideration; and it was reported that the Committee had unanimously recommended the Council to oppose the application if made, and in that event to communicate with other burghs in a similar position with a view to concerted action being taken. The Committee further recommended that the Council should not in the meantime apply for powers to provide and supply electricity under the Electric Lighting Acts. The minutes were agreed to.

At the Hamilton Town Council meeting held on Thursday, the Gas Committee reported that the Manager's statement showed that the cost of the production of gas during the month of October was 10½d. per 1000 cubic feet, and that the illuminating power of the gas was equal to 28·7 candles; while for November the returns were, respectively, 10d. and 28·2 candles. In moving the adoption of the report, which was agreed to, the Provost explained that the accounts recommended for payment for the past two months amounted to over £900.

The question of electric lighting was likewise up for consideration at Thursday's meeting of the Airdrie Town Council. The Clerk reported that on the part of the Council he had given notice of the intention to apply for a Provisional Order under the Electric Lighting Acts for the electric lighting of the burgh; and that plans had been deposited as prepared by Councillor Arthur, so that everything was now in order for deciding as to whether or not they should go on. Meanwhile, he had obtained from the Town Clerks of various towns and cities a statement of what action they were taking. Especially had he got reports from Coatbridge, Hamilton, Dundee, Ayr, and Aberdeen, which he submitted to the Council, and gave some further information regarding the operation of the Electric Lighting Acts and the intentions of the Board of Trade. After some remarks from Mr. D. Martin and Provost Rankin, it was agreed to depart from the application for a Provisional Order; and it was remitted to the Fire and Lighting Committee to get more information on the subject, and generally to act as a Vigilance Committee to watch future developments.

There has again been a great buzz of excitement in the Glasgow pig-iron market this week; but prices are showing a decidedly downward tendency. Scotch iron was selling yesterday at 57s. 10½d. prompt cash; but at the close the quotation was 58s. 11d. per ton. The condition of the price of Cleveland iron is causing much anxiety to some of the holders.

Prices in respect of ell and steam coals have eased off slightly this week, but otherwise there is not much change to report in regard to the Glasgow coal trade. Main coal is quoted at 9s. to 9s. 3d. per ton f.o.b., and the price of splint coal is from 10s. 6d. to 10s. 9d. per ton.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Dec.* 7.

Sulphate of Ammonia.—There is no change to be reported. The market has superficially a quiet appearance; and speculators attempt to make this a symptom of weakness. Inquiries at the works, however, disclose a somewhat different state of things. It is found that not only is sulphate being disposed of as fast as produced, but that full prices are being paid or offered by the very operators who portray the position as dull and weak. This action, of course, leads to but one conclusion—viz., that more sulphate is being required than the buyers care to have known; and it seems absurd, therefore, to talk once more of lower prices. What is it after all, if nitrate has lost most of the strength it displayed a week ago? It has been incontestably proved during the past six months that the price of nitrate does not altogether rule the value of sulphate; and there is, as is known, an excess of supply of the one and a comparative scarcity—not to say shortness of supply—of the other. To the unbiassed eye there is no other conclusion left but that prices must move upward rather than downward, and the real tenden cy will presently be revealed. The business during the week meanwhile includes sales at Hull at £12 3s. 9d. to £12 5s.; and at Leith and Liverpool at £12 2s. 6d. Nitrate has depreciated in value 2s. 6d. to 5s. per ton, both on spot and for cargoes; and it is said that the arrangement between producers is not working at all satisfactorily. Nitrate consumers have assumed an entirely passive attitude, which is likely to conduce to a further shrinking of prices.

LONDON, *Dec.* 7.

Tar Products.—Business has been fairly steady during the week, and most products have maintained their value, with the exception of carbolic, which is weaker. There is a remarkable demand for solvent naphtha, and this article looks like being as valuable as benzol itself. Prices: Tar, 25s. to 30s. per ton, according to position. Benzols (90 per cent.), 3s. 4d. per gallon; (50 per cent.), 2s. 7d. per gallon. Toluol, 1s. 7d. per gallon. Solvent naphtha, 1s. 8d. per gallon. Pitch, 30s. to 35s. per ton. Crude naphtha, 1s. 3d. per gallon. Light oil, 4½d. per gallon. Creosote, 2½d. per gallon. Carbolic acid, 3s. 4½d. per gallon. Cresylic acid, 10d. per gallon. Anthracene (30 per cent.), "A" quality, 1s. 2½d. per unit; "B" quality, 1s. 1d. per unit.

Ammonia Products.—There is an excellent inquiry for sulphate for forward delivery, and very considerable spot shipments are also being made. The article looks stronger than it has done for a very long time; and all this notwithstanding the low price of nitrate. To-day's price of sulphate may be taken as from £12 to £12 5s. Other ammonia products remain stationary as follows: Gas liquor (5° Twaddel), 7s. to 8s. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 1¾d. per lb. Muriate of ammonia, brown, £20 per ton; white, £28 per ton. Sal-ammoniac, £34 to £35 per ton.

THE BURSTING OF THE VYRNWY PIPE-LINE.—At the meeting of the Works Sub-Committee of the Water Committee of the Liverpool Corporation yesterday week, the Water Engineer (Mr. G. F. Deacon) presented a report regarding the bursting recently of some of the pipes forming a portion of the Vyrnwy aqueduct near Oswestry. He stated that, although all the pipes were carefully tested, their carriage by rail frequently had the effect of weakening them; and, on a discussion of the matter, it was said to be no unusual thing for pipes to burst when water was first put into them, however strong they might be.

THE COST OF ELECTRIC AND GAS LIGHTING AT BARNET.—Under the pseudonym of "Pharos," a correspondent in the *Barnet Press* writes: "A perusal of the Local Board proceedings at their last two meetings, I think is well calculated to evoke a strong protest as to the present public lighting arrangements. To begin with: I find the Board in April, 1889, allowed £191 14s. for lighting (electric), and in October, 1889, allowed £220 for the same purpose; making a total of £411 14s. for the year. Up to Sept. 1, 1888, the streets were lighted by 100 ordinary gas-lamps, and four large refuge lamps, two of which were kept burning all night. For these the Gas Company were paid as follows:—100 ordinary lamps at £2 18s., two large lamps at £16, and two others at £10, or a total of £342 per annum. These lamps were replaced by 71 electric lamps; with what result? Less light, and sometimes none at all, at 20 per cent. increased cost! The 30 odd lamps have been left out in the side streets, where they are most needed." It may here be mentioned that a contract has been entered into between the Barnet Gas Company and the East Barnet Local Board for lighting the public lamps for the current year at a reduction of 2s. 6d. per lamp—£2 17s. 6d., instead of £3.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For STOCK MARKET INTELLIGENCE, see *ante*, p. 1101.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	16 Oct.	10½	Alliance & Dublin 10 p. c.	10	17—18	..	5 16 8
100,000	10	,,	7½	Do. 7 p. c.	10	12½—13½	..	5 11 1
800,000	100	1 July	5	Australian (Sydney) 5% Deb.	100	110—112	..	4 9 8
100,000	20	28 Nov.	8	Bahia, Limited	20	19—21*	..	7 12 4
200,000	5	14 Nov.	7½	Bombay, Limited	5	6½—7	..	5 7 1
40,000	5	,,	7½	Do. New	4	4½—5½	..	5 17 10
380,000	Stck.	14 Aug.	12½	Brentford Consolidated	100	217—222	..	5 10 4
125,000	,,	,,	9½	Do. New	100	160—165	..	5 12 2
220,000	20	12 Sept.	11	Brighton & Hove, Original	20	41—43	..	5 2 4
320,000	20	27 Sept.	11½	British	20	43—45	..	5 0 0
50,000	10	12 Sept.	11	Bromley, Ordinary 10 p. c.	10	19—21	..	5 4 9
99,000	10	,,	8	Do. 7 p. c.	10	13—15	..	5 6 8
328,750	10	14 Nov.	10	Buenos Ayres (New) Limited	10	13—14	..	7 2 10
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	107—110	..	5 9 1
150,000	20	14 Aug.	8	Cagliari, Limited	20	25—27	..	5 18 4
550,000	Stck.	16 Oct.	13½	Commercial, Old Stock	100	238—243	..	5 13 2
180,000	,,	,,	10½	Do. New do.	100	195—200	..	5 7 6
180,000	,,	28 June	4½	Do. 4½ p. c. Deb. do.	100	119—124	..	3 12 7
557,320	20	14 June	13	Continental Union, Limited	20	48—49	..	5 6 2
242,680	20	,,	13	Do. New '69 & '72	14	33—35	..	5 4 0
200,000	20	,,	10	Do. 7 p. c. Pref.	20	37—39	..	5 2 6
75,000	Stck.	27 Sept.	10	Crystal Palace District	100	200—205	..	4 17 7
234,065	10	26 July	13	European, Limited	10	22—24	..	5 8 4
120,000	10	,,	13	Do. New.	7½	17—18	..	5 8 4
354,060	10	,,	13	Do. do.	5	10½—11½	−½	5 13 0
5,470,040	Stck.	14 Aug.	13½	Gaslight & Coke, A, Ordinary	100	241—245	−1½	5 12 3
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	100—105	..	3 16 3
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	250—255	..	3 18 5
80,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	123—128	..	3 18 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	182—187	..	4 0 4
1,800,000	,,	,,	7	Do. H, 7 p. c. max.	100	157—162	..	4 6 5
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	248—253	..	3 19 0
1,061,150	,,	14 June	4	Do. 4 p. c. Deb. Stk.	100	114—119	..	3 7 3
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	121—126	..	3 11 5
650,000	,,	,,	6	Do. 6 p. c. do.	100	166—170	..	3 10 7
3,800,000	Stck.	14 Nov.	12	Imperial Continental	100	208—212	..	5 13 2
75,000	5	14 June	6	Malta & Mediterranean, Ltd	5	5—5½	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p.c. Deb.	100	113—118	..	4 6 11
541,920	20	28 Nov.	6	Monte Video, Limited	20	19—20*	..	6 0 0
150,000	5	28 Nov.	10	Oriental, Limited	5	8½—9*	..	5 11 1
60,000	5	27 Sept.	7	Ottoman, Limited	5	5½—6½	..	5 13 0
166,870	10	26 July	4	Pará, Limited	10	4—5	..	8 0 0
420,000	100	2 Nov.	6	People's Gas of Chicago—1st Mtg. Bds.	100	100—105	..	5 14 3
500,000	100	2 Dec.	6	2nd Do.	100	95—100*	..	6 0 0
100,000	10	16 Oct.	10	San Paulo, Limited	10	14—16	..	6 5 0
500,000	Stck.	29 Aug.	16½	South Metropolitan, A Stock	100	290—300	−5	5 8 4
1,350,000	,,	,,	12½	Do. B do.	100	216—221	−4	5 9 9
141,500	,,	,,	13½	Do. C do.	100	240—250	..	5 6 0
600,000	,,	28 June	5	Do. 5 p. c. Deb. Stk.	100	138—142	..	3 10 5
60,000	5	12 Sept.	11½	Tottenham & Edm'ntn, Orig.	5	11—13	..	4 8 5
						*Ex div.		
				WATER COMPANIES.				
717,467	Stck.	14 June	9½	Chelsea, Ordinary	100	265—270	..	3 10 4
1,720,560	Stck.	16 Oct.	7½	East London, Ordinary	100	212—216	−1	3 9 5
544,440	,,	28 June	4½	Do. 4½ p. c. Deb. Stk.	100	143—146	..	3 1 7
700,000	50	14 June	9	Grand Junction	50	128—132	..	3 8 2
708,900	Stck.	29 Aug.	10½	Kent	100	276—281	..	3 14 9
1,043,800	100	28 June	9½†	Lambeth, 10 p. c. max.	100	257—262	..	3 12 6
406,200	100	,,	7½	Do. 7½ p. c. max.	100	200—205	..	3 13 2
200,000	Stck.	27 Sept.	4	Do. 4 p. c. Deb. Stk.	100	110—113	..	3 5 7
600,000	100	14 Aug.	12½	New River, New Shares	100	364—369	+1	3 5 8
1,000,000	Stck.	26 July	4	Do. 4 p. c. Deb. Stk.	100	127—130	..	3 1 6
902,300	Stck.	28 June	6	S'thwk & V'xhall, 10 p.c. max.	100	170—175	..	3 8 6
1,126,500	100	,,	6	Do. 7½ p. c. do.	100	168—173	..	3 9 4
155,006	Stck.	14 June	10	West Middlesex	100	265—270	..	3 14 1

† Next dividend will be at this rate.

ODESSA WATER COMPANY, LIMITED.—The Directors of the Odessa Water Company have issued an interim report to the shareholders, in which they state that, notwithstanding the new works were not available for the last season's demand, the revenue for the half year ended June 30 is considerably in excess of that of the preceding year, and there is every reason to believe that the current half year will also show an increase. Under these circumstances, there can, they think, be little doubt that a fall in the price of water, as regulated by the concession, must be looked for in 1890.

THE PRICE OF GAS AT BOLTON.—During the discussion on the minutes of the Gas Committee at the meeting of the Bolton Town Council last Wednesday, Mr. Broughton said Bolton had been affected by the wave of agitation for increase of wages which had recently swept over the country, and he believed the increase had been conducted with a minimum amount of friction on either side. Speaking generally, the increase would cost somewhere about £3000, and an increase in the price of gas of 2d. or 3d. per 1000 feet would cover the expenditure. It would be an injustice to the Committee if they did not raise the price of gas. Mr. Kirkman was surprised at the statement of Mr. Broughton, as it had not been made in Committee. Personally, he should give it his most determined opposition, considering the enormous profits made by the Committee. The Mayor (Alderman Barrett) said he understood that Mr. Broughton simply shadowed forth what the possible expense would be; and it was a question whether the cost should be borne out of the rates or out of the gas revenues. The proceedings were adopted.

THE PRICE OF GAS AT KINGSTON-UPON-HULL.—A deputation of consumers of gas in what is known as the Old Town waited on the Directors of the Kingston-upon-Hull Gas Company last Wednesday, for the purpose of supporting a resolution asking for a reduction in the price of gas, which had been sent to the Directors from a recent meeting of tradespeople. The resolution asked for a reduction of 1s. per 1000 cubic feet; but the deputation did not urge that figure. The Company's charge, they said, pressed very hardly upon the consumers—tradespeople especially; and it was thought that the Directors would be acting in the interests of the shareholders if they lowered the price. The Chairman (Mr. Peasegood) pointed out to the deputation the difficulties under which the Company laboured. In the first place, their area, he said, was very limited—so limited, in fact, that they were not able to deal with the bye-products in the same complete manner as the British Gaslight Company; and it was from the residuals that the Company made a large amount of their profits. Besides there was a great difference in the position of the Kingston and the British Companies. Their neighbours sold about 600 million cubic feet of gas; whilst in their own case the consumption was only 96 millions. They had spent many thousands of pounds upon their works, in making them as perfect as possible; and for this purpose they had had to borrow money, on which interest had to be paid. If it were possible to reduce the price of gas, the Directors would do it without any lever being applied; but he confessed that, with the increasing price of coal and the higher wages being paid, he did not see any chance of it in the immediate future. The deputation thanked the Board for their courteous reception.

THE MANAGEMENT OF THE STOKE-UPON-TRENT GAS UNDERTAKING.—Touching the question of the management of the Gas Department of the Stoke-upon-Trent Corporation, which was discussed at a public meeting a fortnight since (*ante*, p. 1072), Alderman Robinson, at the last monthly meeting of the Council, moved—"That the Gas Committee shall in future present their resolutions for confirmation by the Council, and submit their accounts to the Finance Committee in the same manner in every respect as is done by the other Committees." He said there was a desire that the proceedings of the Committee should come before the Council for approval or otherwise. They did not wish to interfere with them, nor did they want to reflect on their acts; but they wished that their resolutions should be brought before the Council. Mr. Wynne seconded the resolution. Alderman Leason said there was nothing he wished hidden from the public. He thought the more these matters were made public, the safer they were. The only thing he had contended for in connection with the gas-works had been that the business arrangements by which the profits and loss were made should not be made public to the detriment of the concern. There was a strong feeling in the town among gas consumers that the price of gas should be reduced. If this were done, they would not be able to hand over such profits as they had lately done; but he believed if the price was reduced 6d., the increased consumption that would most likely follow, would place them in the same position as now. He moved as an amendment—"That the present appointments of members of the Gas Committee be rescinded, and that the whole Council be appointed on the Gas Committee." Alderman Faram seconded. After discussion, the amendment was carried by 13 votes to 11.

THE WOLVERHAMPTON CORPORATION AND THE BILSTON WATER SUPPLY.—In the Chancery Division of the High Court of Justice last Friday week, Mr. Cozens-Hardy, Q.C., on behalf of the Wolverhampton Corporation, as plaintiffs in an action brought by them against the Bilston Local Board of Health, applied to Mr. Justice North for an injunction to restrain the defendants, until trial or further order, from supplying the township of Bilston with water other than that supplied by the plaintiffs to the defendants under an agreement dated May 18, 1866. By an Act of the 18th Victoria, the Wolverhampton New Water-Works Company was established for the purpose of supplying water to the town of Wolverhampton and the townships adjacent thereto. The parish of Wolverhampton included the township of Bilston; and by a section of the Act the Wolverhampton Company were forbidden to serve Bilston with water so long as the South Staffordshire Water Company should supply the same under the powers of the latter Company's Act of 1863; provided that such powers were exercised by them. The 50th section of the Wolverhampton Water Company's Act provided that they should sell their undertaking to the Corporation if the latter were disposed to take it. The South Staffordshire Company did not exercise their power to supply Bilston; and on the time allowed for their doing this elapsing, the Wolverhampton Company did so. It was agreed that the Company should supply Bilston with 220,000 gallons of water—at the rate of 5d. per 1000 gallons—per day at least, or such greater quantities of water as should be required at the same rate. By a subsequent Act the Company's undertaking was transferred to the Corporation. The defendants said they were at liberty to supply the township of Bilston with water other than the supply by the plaintiffs; and they read the contract as simply one by which the Board were to take 220,000 gallons per day, and not, as the plaintiffs submitted, as a contract by which the plaintiffs were to supply the township of Bilston with water on the condition that the Board were to pay for 220,000 gallons whether they required it or not. Mr. Moulton, Q.C., for the defendants, contended that, as a public body, they were bound to see that the inhabitants of Bilston were supplied with sufficient quantities of water; that they were not so supplied; and that, therefore, they ought to be allowed to make up the deficiency. His Lordship ordered the motion to stand till the trial of the action, and refused to accede to an application to advance the hearing of the case.

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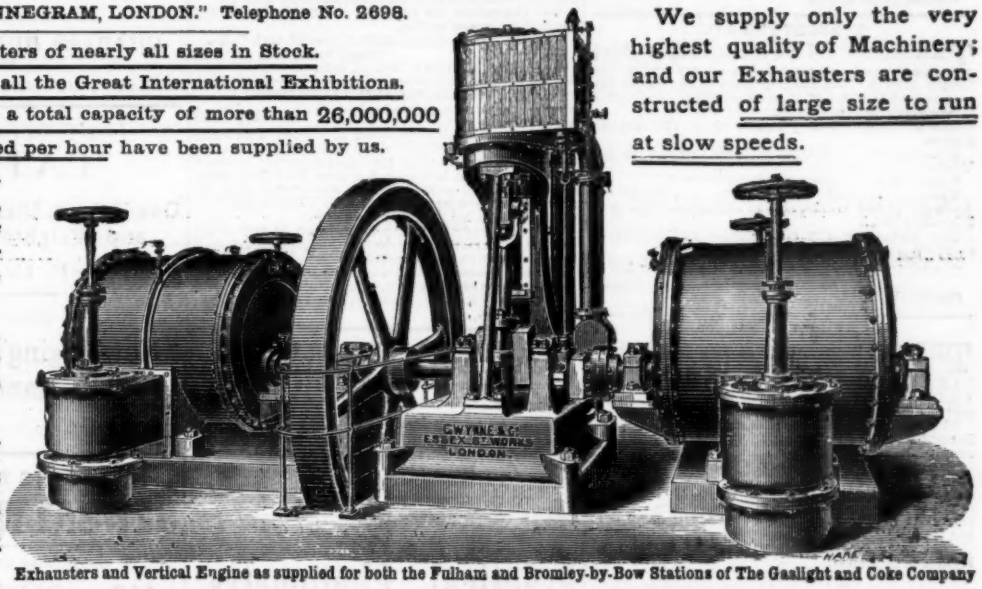

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The Corporation do not bind themselves to accept the highest or any tender.

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TENDERS FOR TAR.

THE Directors are prepared to receive TENDERS for the purchase of surplus TAR for One year, from the 1st of January, 1890.
Quantity, about 500 to 600 tons.
Tenders, endorsed "Tender for Tar," to be sent in not later than the 18th of December.
By order of the Board,
EDWARD P. MARPLES, Secretary.
Gas Offices, Newport, Mon.,
Nov. 29, 1889.

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FENTON URBAN SANITARY DISTRICT.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the AMMONIACAL LIQUOR produced at their Works, for a period of One, Two, or Three years from the 1st of January next.
Sealed tenders to be addressed to the Chairman of the Gas Committee before the 24th inst.
Form of tender and further information may be obtained from the undersigned.
F. H. DARWIN, Manager and Secretary.
Gas Offices, Fenton, Dec. 4, 1889.

FENTON URBAN SANITARY DISTRICT.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the Supply of 3000 or 5000 tons of good GAS COAL or BURGY, to be delivered by boat at their Wharf, and in such quantities as required.
Sealed tenders to be addressed to the Chairman of the Gas Committee before the 24th inst.
Form of tender and further information may be obtained from the undersigned.
F. H. DARWIN, Manager and Secretary.
Gas Offices, Fenton, Dec. 4, 1889.

ROCHDALE CORPORATION.

TO RETORT MAKERS, ETC.

THE Gas Committee of the Corporation invite TENDERS for the supply of such quantities of FIRE-CLAY GOODS (Retorts, Bricks, &c.) as they may require during the year commencing on the 1st of January next.
Forms of tender and full particulars can be had on application to Mr. T. B. Ball, Manager, Gas-Works, Rochdale.
Tenders, endorsed "Fire-Clay Goods," must be sent to me not later than Noon of Wednesday, the 18th of December inst.
By order,
ZACH. MELLOR, Town Clerk.
Town Hall, Rochdale, Dec. 6, 1889.

THE Directors of the Worksop Gas Company invite TENDERS for the purchase of their surplus TAR and AMMONIACAL LIQUOR for One year, commencing the 1st of January, 1890.

The Directors do not bind themselves to accept the highest or any tender.

All communications to be addressed to the Manager; and tenders to be sent in by the 30th of December.

Worksop, Dec. 7, 1889.

TENDERS FOR TAR.

THE Directors of the Weston-super-Mare Gas Company are prepared to receive TENDERS for the surplus TAR made at their Works during the year ending the 31st of December, 1890, or such other term as may be agreed upon.

The minimum quantity will be about 275 tons per annum.

Delivery into Contractor's Tank Wagons at the Works of the Company.

Narrow-gauge Tanks can only be received.

Tenders, endorsed "Tar," to be sent in to the Manager of the Works, not later than the 19th day of December inst.

The highest or any other tender not necessarily accepted.

Any further particulars may be had by applying to

J. H. GRAY.

Gas-Works, Weston super-Mare.

SURPLUS TAR.

THE Gas Committee of the Borough of Doncaster invite TENDERS for the surplus TAR produced at their Works in the Holmes, Doncaster, for a period of One, Two, or Three years, to commence Jan. 1, 1890.

The Tar will be delivered into Tank Barges in the River Don, alongside the Gas-Works, and in no other form.

Tender forms, and any other information, may be obtained on application to Robert Bridge, the Engineer.

Tenders (endorsed) on Committee's form, will be received on or before Wednesday, the 11th of December next, by the undersigned.

The Committee do not bind themselves to accept the highest or any tender.

By order,

H. WAINWRIGHT, Chairman.

Gas-Works, Doncaster, Nov. 28, 1889.

RAWMARSH LOCAL BOARD GAS-WORKS.

CONTRACT No. 5.

TO IRON FOUNDERS AND GAS APPARATUS MAKERS.

THE Rawmarsh Local Board are prepared to receive TENDERS for the Construction and Erection of sundry CAST and WROUGHT IRON-WORK of Retorts, Retort-Bench Mountings, Purifiers, Pillars, Girders, &c., Condenser, and Gas-Mains, on the Premises at Parkgate.

The drawings and specification may be seen at my Office in Rawmarsh, and at the Office of Mr. Thomas Newbigging, C.E., 5, Norfolk Street, Manchester.

Copies of the bill of quantities and form of tender may be obtained from me the undersigned, or from the said Engineer, on deposit of Two guineas, which will be returned on receipt of a *bonâ fide* tender.

Sealed tenders, endorsed "Tender for Ironwork of Retort-Bench, &c., Contract No. 5," to be addressed to the Chairman of the Gas Committee, and sent so as to reach me not later than Twelve o'clock noon, on Monday, the 16th day of December inst.

The Board do not bind themselves to accept the lowest or any tender.

By order,

J. W. BELLAMY, Clerk.

Local Board Offices, Rawmarsh, Dec. 4, 1889.

SURPLUS TAR.

THE Gas Committee of the Corporation of Coventry are prepared to receive TENDERS for the purchase of the surplus TAR produced at their Works, Coventry, for One year, from Dec. 31 next.

Make, about 1500 tons per annum.

Tenders, stating price per ton delivered into Boat, to be addressed to the Manager, and marked "Tender for Tar," not later than Saturday morning, Dec. 14.

The Committee do not bind themselves to accept the highest or any tender.

GEO. WINSTANLEY, Assoc. M. Inst. C. E., Manager, &c.

Gas-Works, Coventry, Nov. 25, 1889.

TO INVENTORS AND PATENTEES.

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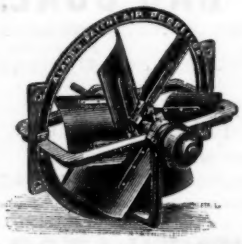

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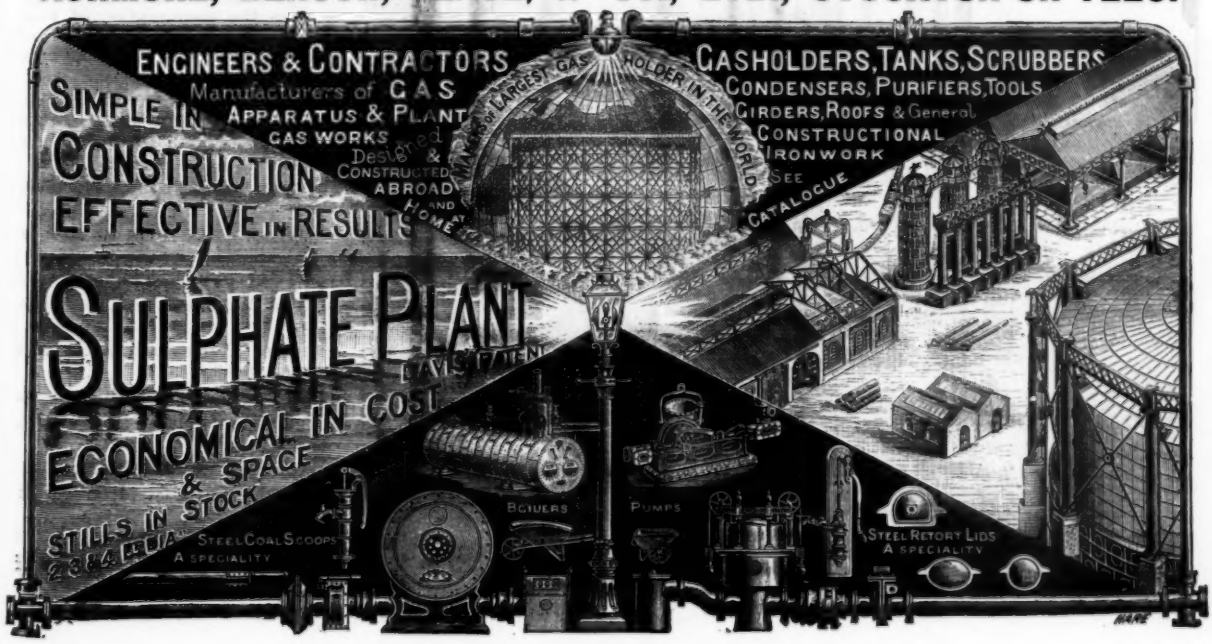

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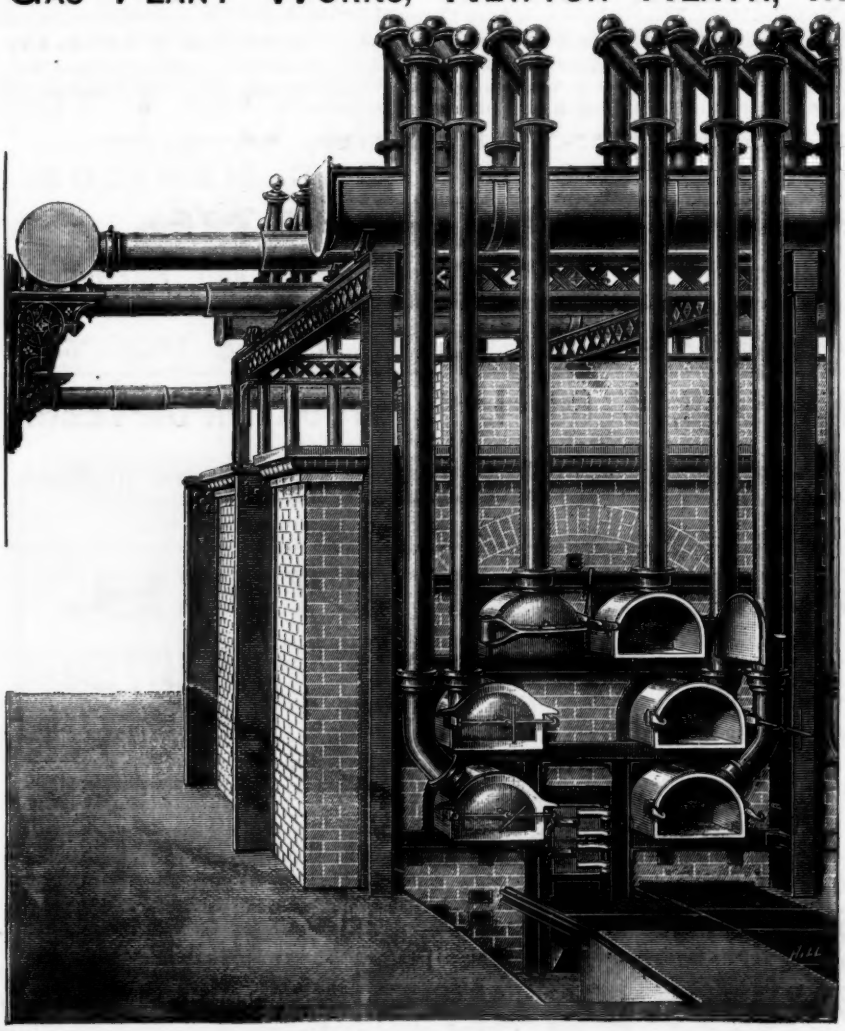

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FOR INDUSTRIAL PURPOSES

GENERATED FROM

BITUMINOUS SLACK COAL

BY THE

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PERFECT IN RESULTS.

PROCESS AND APPARATUS PATENTED IN ALL COUNTRIES.

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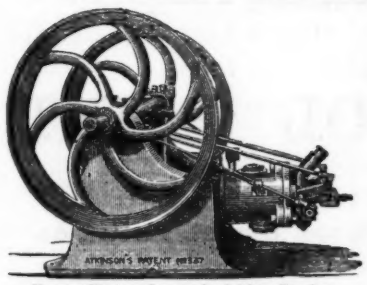

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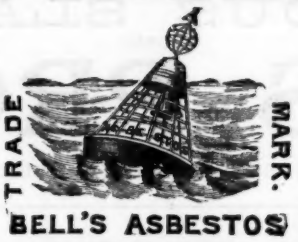

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Bell's Asbestos Aquol Paint is equally suitable for the finest decorative work as well as for general painting. It can be applied over or under any other paint, and, owing to its easy application, can be used with a large distemper brush; the SAVING THUS EFFECTED IN LABOUR BEING **50** PER CENT. OVER THAT OF LEAD PAINTS.

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Every 10 feet has Label as above, and bears our Trade Mark.

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IN ORDERING STATE WHETHER SQUARE OR ROUND IS REQUIRED.

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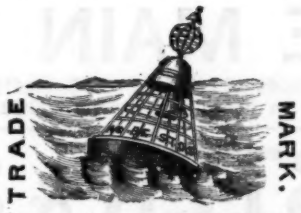

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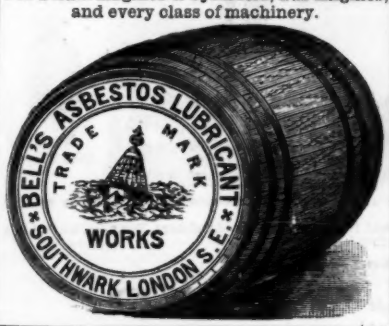
For Steam-Engines & Cylinders, Gas-Engines, and every class of machinery.



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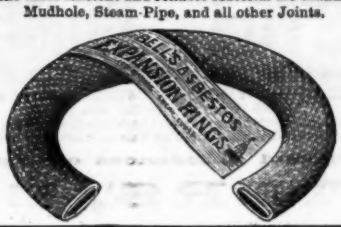

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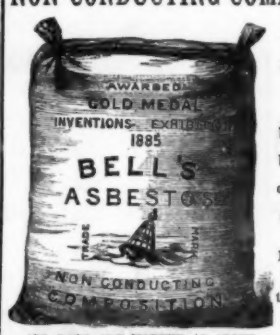

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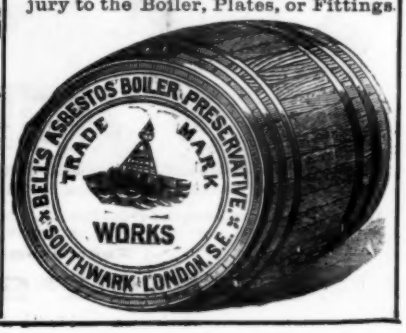

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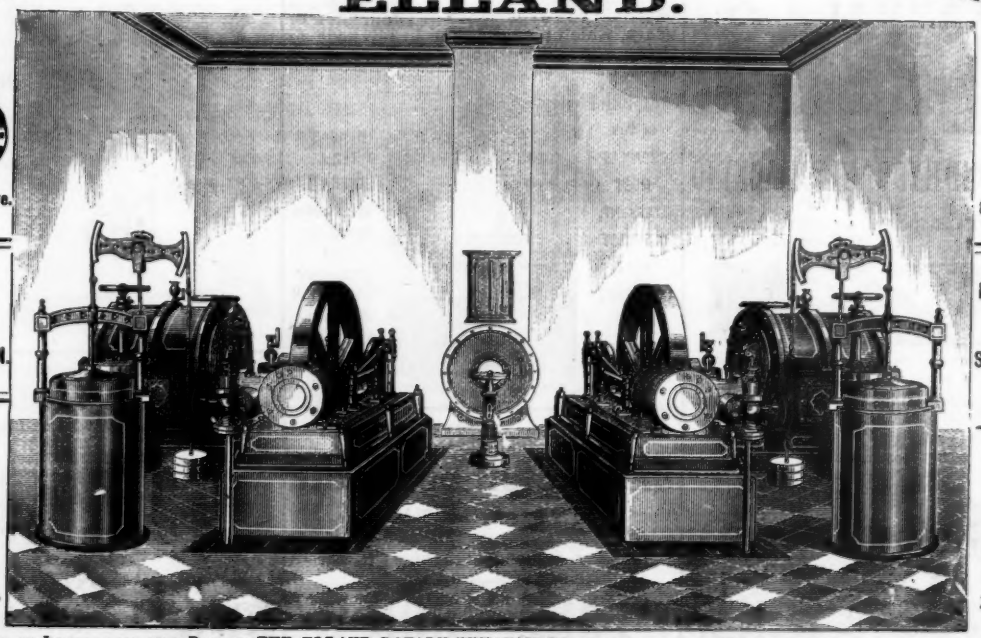

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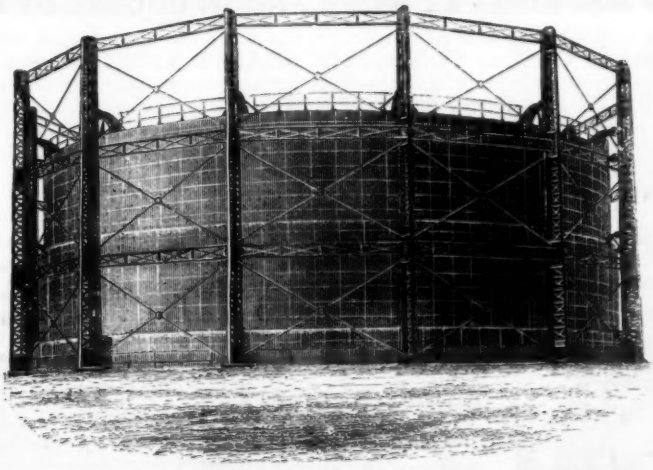

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